REVIEW OF METAL LITERATURE

An Annotated Survey of Articles, Technical Papers and Reports Appearing in Engineering, Scientific and Industrial Journals and Books, Here and Abroad, Prepared at the Center for Documentation and Communication Research, Western Reserve University, Cleveland, With the Cooperation of the John Crerar Library, Chicago.

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PREFACE

The A.S.M. Review of Metal Literature is a monthly feature of *Metals Review*, published by the American Society for Metals and distributed to its members. The present volume is a collection of the installments published in *Metals Review* from January through December 1957. It is the fourteenth volume in a series that began in 1944.

In most instances, the annotations are not intended to serve as a substitute for a reading of the articles listed. They are brief abstracts designed to indicate the scope and content of the article so that the reader may determine whether it is something he wants to read in its entirety. In other words, they are indicative rather than informative abstracts.

The table of contents lists the main headings into which the A.S.M. Review of Metal Literature is subdivided, together with secondary subdivisions indicating the scope of the main heading. The main sections are designated by capital letters, and individual annotations are identified by the appropriate capital letter preceded by a serial number.

The method of classifying the annotations into subject subdivisions is based upon the "ASM-SLA Metallurgical Literature Classification, International (Second) Edition," published by the American Society for Metals in 1958. Each annotation is likewise followed by code symbols which refer to the subdivisions and schedules of the ASM-SLA Classification.

An understanding of this coding system, however, is not essential to the use of this volume of the Review of Metal Literature, which is accompanied by a complete subject index starting on page 911. Since the annotations are classified primarily by processes and properties, the subject index has been prepared with the emphasis primarily on materials. Subheads and cross-references are included in sufficient detail to permit the location of articles on any specific subject related to the metal industry. Indexing is based on the content of the article and not merely on the title.

In using the book, if the primary interest is in the broad field of corrosion, or foundry practice, or heat treatment, turn immediately to the respective section as given in the table of contents. If the main interest is in aluminum alloys, or copper, or cast iron, turn to the corresponding heading in the subject index. If interest lies in specific aspects of foundry practices, or a particular type of heat treatment, these broad processes will be found indexed and subdivided in the subject index. An author index is also provided and a list of addresses of the journals and periodicals from which the literature references are taken.

The annotations have been prepared by technical abstractors and translators under the direction of Cedric R. Flagg of the Center for Documentation and Communication Research of Western Reserve University. Much assistance in the perusal and selection of material has been given by the John Crerar Library of Chicago. Annotations carrying the designation (CMA) following the reference are published also in *Crerar Metals Abstracts*.

Marjorie R. Hyslop
Editor

May 1, 1958

TABLE OF CONTENTS

SECTION A

GENERAL METALLURGICAL

1-A. ALAR 00.12 Aluminum Casting Alloy. *Alloy Digest,* no. Al-45, Nov. 1956.

Composition, physical constants, mechanical properties of castings, castability, weldability and corrosion resistance. (A general; Al, 5)

2-A. Bisbo Pearlitic Malleable Iron. *Alloy Digest,* no. CI-17, Nov. 1956.

Composition, properties, heat treatment and machinability. (A general; CI)

3-A. Ni-Vee Type E Leaded Bearing Bronze. *Alloy Digest,* no. Cu-44, Nov. 1956.

Composition, mechanical properties, machinability, castability, corrosion resistance and general characteristics. (A general; Cu)

4-A. Eclipsaloy 517 Magnesium Sand Casting Alloy. *Alloy Digest,* no. Mg-29, Nov. 1956.

Composition, casting properties, machinability, weldabilty and corrosion resistance. (A general; Mg)

5-A. Hastelloy Alloy-D Corroson Resisting Alloy. *Alloy Digest,* no. Ni-29, Nov. 1956.

Composition, physical constants, mechanical properties, weldability and corrosion resistance. (A general; Ni-f)

6-A. AISI 3130 Nickel-Chromium Alloy Steel. *Alloy Digest,* no. SA-50, Nov. 1956.

Composition, mechanical properties, heat treatment and machinability. (A general; AY)

7-A. Armco 22-4-9 Corrosion and Heat Resistant Steel. *Alloy Digest,* no. SS-49, Nov. 1956.

Composition, physical constants, mechanical properties, heat treatment, workability, pickling and general characteristics. (A general; SS)

8-A. Vanadium Type "D" Chromium-Vanadium Tool Steel, Type L2. *Alloy Digest,* no. TS-52, Nov. 1956.

Composition, physical constants, mechanical properties, heat treatment, machinability and general characteristics. (A general; TS)

9-A. Thermenol—a New "Soft" Magnetic Alloy. J. F. Nachman and W. J. Buehler. *Electrical Manufacturing,* v. 58, Nov. 1956, p. 140-142, 145, 354.

Nonstrategic ternary system of iron-aluminum-molybdenum is under heavy investigation as a high-temperature structural material, might become a replacement for critical nickel or cobalt magnetic alloys. (A general; SG-p, SG-h)

10-A. (Spanish.) **Technical Documentation and International Cooperation. Application to Metal Joining.** Lise Blosset. *Tecnica Metalurgica,* v. 12, no. 105, May-June 1956, p. 82-92.

Various factors of documentation studied and applied to the organization of information in a definite industry. Improvements of methods in the welding field. Other special techniques. (A14, K general)

11-A. Zinc: Properties and Uses in Modern Industry. *Canadian Mining and Metallurgical Bulletin,* v. 49, no. 535, Nov. 1956, p. 742-754; *Canadian Institute of Mining and Metallurgy, Transactions,* v. 59, 1956, p. 410-422.

A series of seven papers on die casting, zinc rolling, continuous galvanizing of steel band, zinc grades and specifications, alloys and corrosion, research and development, and general trends and economics. (A general; Zn)

12-A. Titanium Moves Into Process Equipment. G. T. Bedford, W. J. Weeks and A. G. Caterson. *Chemical Engineering,* v. 63, Dec. 1956, p. 238 + 5 pages.

Economics and availability of titanium, physical and mechanical properties, fabricating, corrosion resistance. (A general; Ti)

13-A. Nuclear Irradiation and Radioisotopes in Metal Research. Massoud T. Simnad. *International Journal of Applied Radiation and Isotopes,* v. 1, no. 3, Nov. 1956, p. 145-171.

Review of research using nuclear irradiation in detecting minute quantities of impurities or minor constituents and in studying metal structure; also, use of radioisotopes in studies of segregation, friction, vapor deposition, vapor pressure, slag-metal reactions, electrolytic action on metal surfaces, diffusion and oxidation. (A general, 14-13, 2-15)

14-A. Aluminium in the Economy of the United Kingdom. W. J. Thomas. *Light Metals,* v. 19, Nov. 1956, p. 344-347.

Production, consumption and uses. (A4p; Al)

15-A. Titanium Design Notes. *Magnesium,* Nov. 1956, p. 10-15.

Properties, formability, welding characteristics, corrosion resistance. (A general; Ti)

16-A. A Dictionary of Metallurgy. A. D. Merriman and J. S. Bowden. *Metal Treatment and Drop Forging,* v. 23, Nov. 1956, p. 457-464.

From "tophat" to "ultimate strength". (To be continued.) (A general, 11-17)

17-A. (French.) **Present and Possible Future Uses of Metallic Molybdenum.** J. Fabry and P. Gousseland. *SIM-Documentation Métallurgique,* 1956, no. 27, July-Sept. 1956, p. 223-233.

Chemical properties of metallic molybdenum, especially its behavior in the presence of corrosive agents. Possible applications in remote control engines and nuclear reactors. (A general, R general; Mo, 18-2)

18-A. (German.) **Malleable Cast Iron.** F. Roll. *VDI Zeitschrift,* v. 98, no. 31, Nov. 1956, p. 1765-1767.

Melting and molding techniques. The alloy tolerances for a satisfactory specimen. New uses from welding this material with steel. (A general; CI)

19-A. (Russian.) **Reducing Production Costs of Electric Steel Melting.** A. F. Kablukovskii. *Metallurg,* no. 10, Oct. 1956, p. 14-17.

A commercial process was studied to improve furnace production, quality and output of metal, the consumption of electric energy. (A4s, D5; ST)

20-A. The First Half-Century of Electric Furnace Steel Making. S. B. Casey, Jr. *Journal of Metals,* v. 8, Dec. 1956, p. 1637-1641.

Evolution of furnace design, development of electrical equipment, other developments cutting down time and speeding operation, expectations from the second half century. (A2, D5; ST)

21-A. The Cyclical Movement of Steel Scrap Prices. Chapin Hoskins. *Journal of Metals,* v. 8, Dec. 1956, p. 1651-1653.

For over 50 years scrap steel price has risen and fallen cyclically. Cycles can be effectively measured in terms of rate of change and are related to cycles in other prices and business activity. (A4q; ST, AD-b)

22-A. (Book.) **Chemical Engineering Practice. v. II. Solid State.** Herbert W. Cremer and Trefor Davies, editors. 632 p. 1956. Academic Press, 125 E. 23rd St., New York 10, N. Y.

Fundamental concepts of matter in the solid state, properties of metals, alloys, plastics and glasses, corrosion of metals, porous masses and their uses, powder metallurgy. Pertinent papers individually abstracted. (A general)

23-A. (Book.) **Stainless Steel Handbook.** 120 p. 1956. Allegheny Ludlum Steel Corp., Pittsburgh 22, Pa.

Analyses; properties; fabrication; applications. (A general; SS)

24-A. (Book.) **Year Book of American Iron and Steel Institute.** 268 p. 1956. American Iron and Steel Institute, 150 East 42nd St., New York 17, N. Y.

A collection of papers on steel's depreciation problem, joint responsibility of management and labor, and metallurgical aspects in the design of a new continuous annealing line. (A5, J23, 17-1; ST)

25-A (Book—French.) **Report of Activity Up to Dec. 31, 1954.** *Rapport d'Activite arrete au 31 Decembre 1954.* 362 p. 1956. L'Institut de Recherches de la Siderurgie (IRSID), 185 Rue Président Roosevelt, Saint-Germain-en-Laye (S.-&-O), France.

The situation of IRSID and activities of the Metallurgical Study Center (CESSID) at the end of 1954. The following studies were of special interest; ore enrichment, gravity separation, pneumatic separation, high and low-intensity magnetic separation and applications, making of pig iron with different cokes, speed and mechanism of reaction in metallurgy, variation of the ductility distribution in soft steels. (A9h; CI, CN)

26-A. Report on Russia, Part 3 . . Research and Training. *American Machinist*, v. 100, Dec. 17, 1956, p. 116-119.

Description of ENIMS, the Russian tool research organization; photographs of new machine tools developed. (A9h, W25)

27-A. Main Metal: A New Aluminum Zinc Alloy Suitable for Extrusion and Sand and Die Casting. *Automobile Engineer*, v. 46, Dec. 1956, p. 534-535.

New light, easy to machine alloy with good bearing properties. Machining techniques suggested. (A general, G17; Zn, 4-8, 5-10, 5-11)

28-A. San Antonio Chemicals Starts With Waste Liquor From Lithium Processing . . . Recovers Mixed Carbonates Rich in Scarce Rubidium, Cesium. *Chemical Week*, v. 79, Dec. 29, 1956, p. 78-80.

70% K_2Co_3, 23% Rb_2Co_3, 3% Na_2Co_3, 2%Cs_2Co_3, 1% Li_2Co_3 from lithium end liquors. (A11c; Li, Rb, Cs)

29-A. New Magnesium Alloy for Sounder Castings. W. E. Pearson and T. E. Leontis. *Iron Age*, v. 178, Dec. 13, 1956, p. 127-129.

Magnesium alloy designated AZ 81A is 7.6% aluminum, 0.7% zinc; alloy has low microporosity, good castability, responds to heat treatment and has desirable mechanical properties. (A general; Mg, 5)

30-A. Let Conditioners Clean up Your Air Problems. W. G. Patton, *Iron Age*, v. 178, Dec. 13, 1956, p. 136-137.

Plant-wide air conditioning protects product quality and workers' comfort for battery manufacturer. (A5, W1)

31-A. Nickel Silvers. John L. Everhart. *Materials and Methods*, v. 44, no. 6, Dec. 1956, p. 117-132.

Copper-nickel-zinc alloys characterized by white color and corrosion resistance. Data on commercial grades, engineering properties, forming, machining, heat treating, joining, cleaning, finishing and applications. (A general; Cu)

32-A. A Dictionary of Metallurgy. A. D. Merriman and . S. Bowden. *Metal Treatment And Drop Forging*, v. 23, Dec. 1956, p. 487-494.

From "ultrabasite" to "vialbra". (To be continued.) (A general, 11-17)

33-A. How to Collect and Dispose of Magnesium Dust and Chips. T. Kenneth McGuire. *Modern Metals*, v. 12, no. 11, Dec. 1956, p. 38-41.

Ducts and hoods designed to prevent the accumulation of dust used in combination with wet collection equipment allow safe handling and disposal. (A8a, A8d; Mg)

34-A. Aluminum's Future. Bert Inch. *Modern Metals*, v. 12, Dec. 1956, p. 62-65.

Predicts that consumption will double by 1965 with automobiles, boats and furniture being the largest users. (A4p, T21, T22, T10; Al)

35-A. End-Use Statistics Show Where the Aluminum Goes. *Modern Metals*, v. 12, Dec. 1956, p. 74.

End use of wrought products, permanent mold castings and sand castings. (A4p; Al)

36-A. New World of Manufacturing. Del S. Harder. *Steel Processing*, v. 42, Dec. 1956, p. 683-685, 714.

Predictions of developments in mining, materials and manufacturing. (A general, B12; 17)

37-A. Super-High Strength Constructional Steels. H. P. Tardif. *Steel Processing*, v. 42, Dec. 1956, p. 702-704, 709-710.

Review of composition and optimum physical properties of typical ultra high-strength steels such as modified medium carbon triple alloy steels; possible new procedures; heat treating, hardening and machining. 25 ref. (A general; AY, SGB-s)

38-A. Zircaloy Alloys. D. E. Thomas. Paper from "Zirconium-Technology and Economics". Atomic Industrial Forum, p. 47-50. (CMA)

The Zircaloys may be described as tin and iron alloys of zirconium. Crystal bar zirconium and Zr-Sn alloys did not come up to expectations. In Zircaloy-2, the 1.5% Sn is in solid solution and the iron, nickel and chromium are present as precipitated intermetallic phases. The transverse and longitudinal tensile strengths are about equal. Cold working to 60% is practical; strength is then increased. Crystallography and heat treatments discussed. (A general; Zr)

39-A. Over-All Supply of Refined Zirconium Metal. N. C. Bartholemew. Paper from "Zirconium—Technology and Economics". Atomic Industrial Forum, p. 59-64. (CMA)

Prospective users of zirconium are urged to choose their data carefully and use only those assigned to the particular process used. Present market, current research and de-

velopment reviewed, considerations in forcasting zirconium demand enumerated. (A11a, A4p, Aq; Zr)

40-A. Commercial Products Available. W. C. Greenleaf. Paper from "Zirconium — Technology and Economics". Atomic Industrial Forum, p. 65-68. (CMA)

Prices for conversion of zirconium or Zircaloy ingots to verious sizes of fabricated forms are tabulated. The costs of melting sponge to ingot given. (A4q; Zr)

41-A. (French.) **Zirconium.** René Faivre. *Chimie et Industrie (Supplément: Energie Nucléaire)*, v. 76, Oct. 1956, p. 32-45. (CMA)

Physical, chemical and mechanical properties of zirconium briefly outlined, including effective cross section (unusually low) for the absorption of thermal neutrons. Zirconium ores and their principal deposits are enumerated, and the principal metallurgical processes for preparing metal zirconium are explained. 35 ref. (A general; Zr)

42-A. (Japanese.) **Permanent Magnet Selection and Application.** Kuzuo Yamakawa. *Metals*, v. 26, Dec. 1956, p. 938-944.

Kinds of magnetic materials; application and function of permanent magnets (magnets for electrical measurement, radio, television, Brown tubes, generators, speed meters, electric motors). A new permanent magnet described.
(A general; SGA-n)

43-A. (Japanese.) **Developing of Permanent Magnet.** *Metals*, v. 26, Dec. 1956, p. 945-949.

Permanent magnets developed, produced and applied in Japanese industry. (A general; SGA-n)

44-A. (Japanese.) **Sintered Aluminum Powder as Atomic Furnace Material.** *Metals*, v. 26, Dec. 1956, p. 953-959.

Method for production of SAP (sintered aluminum powder); physical and mechanical properties of SAP; mechanical properties at high temperature, mechanical working and corrosion of SAP. 24 ref.
(A general; Al, 6-22)

45-A. (Japanese.) **Silicon Zinc Bronze.** Tamotsu Nakai. *Metals*, v. 26, Dec. 1956, p. 969-970.

List of silicon zinc bronzes. Phase diagram, chemical composition, production methods, workability; physical, chemical and mechanical properties. (A general, Cu)

46-A. (Japanese.) **Phosphor Bronze.** Takeo Tada. *Metals*, v. 26, Dec. 1956, p. 971-972.

Chemical, physical and mechanical characteristics; heat treatments and application of phosphor bronze.
(A general, Cu)

47-A. (Japanese.) **Special Phosphor Bronze.** Myokazu Kamitani. *Metals*, v. 26, Dec. 1956, p. 973-974.

Chemical composition, production method, workability and heat treatment of special phosphor bronze.
(A general; Cu)

48-A. Phenomenal Growth of the Titanium Industry. W. Schweisheimer. *Australasian Engineer*, v. 49, Nov. 7, 1956, p. 65-66. (CMA)

The status of the titanium processing industry in the United States is described; new plants and expansions of existing facilities are frequent developments. Ore sources are found scattered throughout the world but are chiefly in the form of beach sands containing rutile. The Oaxaca rutile deposits are noted. An example of titanium application is the Hi-Ti bolts of Standard Pressed Steel Co.
(A4p, A11a, T general; Ti)

49-A. Steel Making Since Bessemer. Charles Goodeve. *Machinery Lloyd (Overseas Edition)*, v. 28, Dec. 8, 1956, p. 70-77.

Comments on the inventions of Henry Bessemer, and some later developments in steelmaking.
(A2, D general; ST)

50-A. New Occurrences of Vanadium Minerals (Mottramite, Descloizite, and Vanadinite) in the Caldeck Area of Cumberland. A. W. G. Kingsbury and J. Hartley. *Mineralogical Magazine*, v. 31, Dec. 1956, p. 289-295. (CMA)

Four new occurrences of vanadiferous minerals in the British Isles described. Powder photographs are shown for descloizite, mottramite and vanadinite. X-ray data are tabulated. (A11a; V)

51-A. Opportunities for Minerals Research. J. H. East, Jr. *Mines Magazine*, v. 46, Nov. 1956, p. 63-66.

Extensive research required for full development of Missouri Basin mineral reserves. 13 ref.
(A11a; RM-n)

52-A. U. S. Program and Policies in the Uranium Field. Jesse C. Johnson. *South African Mining and Engineering Journal*, v. 67, Part 2, no. 3329, Nov. 30, 1956, p. 907-911.

American and world production of uranium; current power reactor economics. (A4p, W11; U)

53-A. Metalworking Facts and Figures. *Steel,* v. 140, Jan. 7, 1957, p. 167-214.

Data on production, shipments, consumption and prices of irons, steels, aluminum, copper, lead, zinc, magnesium, titanium, nickel, tin and antimony. Units produced for transportation, industrial equipment, containers, refrigeration, home appliances and farm machinery. Sales, price and labor information. (A4p, T3, T10, W general)

54-A. Nonferrous Metal Production Forum on Technical Progress. *Steel,* v. 140, Jan. 7, 1957, p. 224-254.

Important factors in the past and coming year in production as briefly stated by 18 of the industry's leaders. A few of the points are: short supply of nickel; increased production of titanium and aluminum; technological improvements increase use of titanium and magnesium. (A4p, T general; Ni, Ti, Al, Mg)

55-A. Materials and Metallurgy Forum on Technical Progress. *Steel,* v. 140, Jan. 7, 1957, p. 266-290.

Twenty-nine of the industry's executives state important developments and possible future trends. A few of the features are: rapid development of vacuum melting; 200-series stainless steel alloys find increasing use; advances made in materials for aircraft applications capable of withstanding high temperatures. (A general)

56-A. Bright Supply Outlook for Aluminum Clears Way for Rapid Development of New Uses and Markets. I. W. Wilson. *Waste Trade Journal,* v. 106, Jan. 5, 1957, p. 35-42.

Three million tons will be available by 1958; usage may be five million tons by 1957. (A4p; Al)

57-A. In Diversified Manufacturing Operations Production Control Is the Key. A. R. Weigel. *Western Machinery and Steel World,* v. 47, Dec. 1956, p. 70-72.

Procedure followed in job scheduling. (A5b)

58-A. Zirconium and Zirconium Alloy Products. M. F. Judkins. Paper from "Zirconium—Technology and Economics", Atomic Industrial Forum, p. 85-87. (CMA)

Zirconium has been available in small amounts for some time as iodide crystal bar, and Kroll sponge is now available in tonnage lots. Tubing may be fabricated by roll forming, welding of strip and swaging, by piercing and drawing and by extrusion. Size ranges are given for ingots, billets, slabs, bar, strip, sheet and wire. High cost of the metal discussed. (A general, A11a, F general; Zr)

59-A. (English.) **Notes on the Geochemistry of Germanium.** Hiroshi Onishi. *Chemical Society of Japan, Bulletin,* v. 29, Aug. 1956, p. 686-694.

Occurrence of germanium; analyses of germanium-bearing rocks. (A11a, S11; Ge)

60-A. (French.) **Metallurgy of Uranium.** G. Cabane. *Energie Nucleaire,* v. 76, no. 4, Oct. 1956 supplement, p. 18-24.

Developments in the metallurgy of uranium during the past 10 years. 52 ref. (A general; U)

61-A. (Report.) **Development of a Forgeable High-Strength, High-Temperature, Chromium-Rich, Chromium-Iron Alloy, Part 2.** D. P. Moon, H. A. Blank and A. M. Hall, Battelle Memorial Institute for Wright Air Development Center. 26 p., Oct. 1954. U. S. Office of Technical Services PB 121112. $.75.

Report concerns production of experimental alloys composed of 70 Cr, 30 Fe, 9 Mb, 2 to 3 Ti and up to ½ Al by induction melting charges of commercially available melting stock, casting into molds, and fabricating by various hot working methods. Forged bars exhibited remarkable thermal-shock properties up to 2000° F. (A general, D6, F general, Q23s, 2-12; Cr, SGA-h)

62-A. (Pamphlet—Russian.) **High-Strength Aluminum Alloy V95.** I. N. Fridlyander and Ye. I. Kutaytseva. 62 p. 1956. *Informataiva o Nanchno-Issledoyatel' Skikh Rabotakh* No. I-56-34, Moscow.

Extensive review of the Soviet aluminum alloy V-95. Mechanical properties of the aluminum-magnesium-zinc-copper system, the solution treatment, precipitation hardening, and corrosion resistance of aluminum-magnesium-zinc and aluminum-magnesium-zinc-copper system alloys and the effect of manganese and chromium and iron and silicon on the V-95 alloy. (A general; Al)

63-A. (Book.) **Chromium-Nickel Austenitic Steels.** F. H. Keating. 138 p.

1956. Butterworths Scientific Publications, 88 Kingsway, London, W.C.2. $3.50.

A reference book for the practical man, covering the development and metallurgy of these steels, manufacturing and fabricating processes, castings, mechanical and physical properties, corrosion resistance, and chemical analysis. (A general; SS)

64-A. (Book.) **Encyclopaedia of the Iron and Steel Industry.** A. K. Osborne. 558 p. 1956. Technical Press Ltd., North Circular Rd., Neasden, London, N. W. 10, England: also Philosophical Library, Inc., 15 East 40th St., New York 16, N. Y. $25.00.

Expansion of the "Glossary" previously compiled by the author. Includes "New Processes" section and bibliography.
(A general; Fe, ST; 11-17)

65-A. (Book.) **Materials and Processes in Manufacturing.** E. Paul DeGarmo. 755 p. 1957. MacMillan Co., 60 Fifth Ave., New York 11, N. Y. $8.50.

College text for engineering students. Introduction to materials, machine tools and manufacturing methods with emphasis upon choice, handling and behavior of materials. Considerable use of visual illustrations. Selected bibliography.
(A general, 1; 17-7)

66-A. (Book.) **Reaumur's Memoirs on Steel and Iron.** Anneliese Grunhaldt Sisco. 395 p. 1956. University of Chicago Press, 5750 Ellis Ave., Chicago 37, Ill. $6.00.

Reproduction of the first significant book ever devoted to the iron and steel industry. (A2; Fe, ST)

67-A. (Book.) **Statistical Tables on Aluminum, Lead, Copper, Zinc, Tin, Cadmium, Magnesium, Nickel, Mercury and Silver.** 219 p. 1956. Statistics compiled by Metallgesellschaft AG., Reuterweg 14, Frankfurt Am Main, Germany.

Surveys production, consumption and prices, 1946-1955.
(A4p, A4q; Al, Pb, Cu, Zn, Sn, Cd, Mg, Ni, Hg, Ag)

68-A. (Book.) **Zirconium—Technology and Economics.** Industrial Committee on Reactor Materials Subcommittee on Process Metallurgy and Fabrication. 113 p. 1956. Atomic Industrial Forum, Inc., 260 Madison Ave., New York 16, N. Y. (CMA)

The proceedings of a meeting on zirconium technology and economics held in New York on Nov. 17-18, 1955. Topics covered include production of metallic zirconium, fabrication, properties, supply, commercial products available, future requirements. Papers are abstracted separately. (A general; Zr)

69-A. (Book.) **English-German and German-English Dictionary for the Iron and Steel Industry.** Edward L. Kohler. 330 p. 1955. Springer Verlag, Vienna, Austria.

Vocabulary taken from current technical literature for use of iron and steel engineers and translators. (A general, 11-17; Fe, ST)

70-A. What's Ahead in Steel Research? E. C. Bain, *Chemical and Engineering News*, v. 35, Feb. 4, 1957, p. 26.

Use of oxygen for metallurgical refining, direct reduction of iron ore and high-strength alloys are mentioned.
(A9, D8j, D10; ST, SGB-a)

71-A. Casting Design. A Teaching Method. L. B. Zylstra and W. A. Snyder. *Foundry*, v. 85, Feb. 1957, p. 126-129.

Course for engineering students at University of Washington demonstrates the importance of design in facilitating manufacture.
(A3, E general, 17-1)

72-A. Some Metallurgical Advances: How and Why They Occurred. Werner Koster. *Institute of Metals, Journal*, v. 85, Dec. 1956, p. 113-118.

Advances in the field of metallurgy: age-hardening alloys, stainless steels, permanent-magnet alloys; varied ways in which discoveries may come about; future of metallurgy as an independent of science. 22 ref. (A general)

73-A. Let Aluminized Suits Speed Openhearth Repairs. *Iron Age*, v. 179, Jan. 24, 1957, p. 86.

Aluminized asbestos clothing shortens waiting period for cooling openhearth. (A7p, D2, 18-22)

74-A. The Prevention of Gas. Thomas A. Watson. *Iron and Steel Engineer*, v. 34, Jan. 1957, p. 82-88.

Characteristics and effects of gases most commonly found in steel plants. Organization, equipment, procedures, precautions to be observed in and around boiler house, opening blast furnace gas, gas engines, gas power engine to prevent gas accidents. (A7p; ST, RM-g)

75-A. Developments in the Iron and Steel Industry During 1956. I. E. Madsen. *Iron and Steel Engineer,* v. 34, Jan. 1957, p. 119-169.

Foreign plants, raw materials, blast furnaces, rolling, finishing, furnace controls, and material handling. (A general, D general, F general; ST)

76-A. Symposium on Titanium I. Sponge and Mill Production Economics. H. H. Kellogg. *Journal of Metals,* v. 9, Jan. 1957, p. 161-166. (CMA)

Predictions are cited for future prices of titanium sponge (less than $1.40 per lb.) and mill products. A cost analysis is presented for sponge production and a number of economies which might be possible are indicated. These include increase of recovery of saleable sponge to 96%, recycling $MgCl_2$, reduction in rutile price, maintenance, research and testing, and reductions in labor force. The average price of mill products is now $13 per lb. Rather small size of orders for mill products contributes to higher costs. The main future reductions in mill product costs will come from savings in sponge processing. (A4s; Ti)

77-A. Symposium on Titanium II. Mill and Fabrication Economics. S. A. Gordon. *Journal of Metals,* v. 9, Jan. 1957, p. 167-172. (CMA)

Failure to reduce fabrication costs for titanium mill parts could easily make cost a first consideration in selecting a material. The most serious obstacle to reducing fabrication costs appears to have been the lack of a consistent fabrication technology by the aircraft builders. Uniformity of the material should remove this obstacle. Comparison is made with aluminum fabrication for aircraft. (A4s, F general; Ti)

78-A. Symposium on Titanium IV. Practical Problems Associated With the Control of Interstitials III. Shop Practice for Control of Interstitials. H. Brown. *Journal of Metals,* v. 9, Jan. 1957, p. 182-184. (CMA)

Cleaning, forming, descaling, welding and heat treatment of titanium are recommended for shop practice. General contamination control requires the minimum number of operations and an aluminum coat for forging operations or hot forming; the coat is removable by pickling. Deviations from established practice will probably be expensive. (A general, 18, 3-19; Ti)

79-A. Development of the Aluminum Industry in Austria. Eduard Nachtigall. *Metal Progress,* v. 71, Jan. 1957, p. 77-81.

Now that Austria has regained control of her aluminum industry, several special products for consumers have been devised, including siding and roofing, snow fences, electrical conductors, nails and deep drawing sheet. (A4p, T general; Al)

80-A. Classification of Titanium Alloys. T. W. Lippert. *Metal Progress,* v. 71, Jan. 1957, p. 112-B. (CMA)

Current systems for identifying titanium alloys are based either on alloying additions or on tensile or yield strength values. A nomenclature is proposed which first identifies the alloy as titanium-base by use of the letter T. Five digits follow: the first indicated what principal kind (if any) β addition has been made, the second the total percentage of β addition, the third the total percentage of aluminum, tin and/or zirconium, and the fourth and fifth the oxygen percentage plus twice the nitrogen percentage expressed in hundredths. (A general; Ti, 15-11)

81-A. Service and Maintenance Forum on Technical Progress. *Steel,* v. 140, Jan. 7, 1957, p. 419-428.

Sixteen executives briefly state present trends and problems. A few of these are: adequate air movement and ventilation, tighter management of water, cathodic protection for industrial piping. (A general, 18-21)

82-A. Automatic Scrap Disposal. *Tooling and Production,* v. 22, Jan. 1957, p. 149.

High tonnage press unit for automobile makers. (A8d; RM-p)

83-A. Metals Ban Lift Will Speed High Temp Alloy Research. R. H. Thielmann. *Western Metals,* v. 15, Jan. 1957, p. 68-71.

Removal of quota restrictions increases possiblities of utilizing high-temperature properties of columbium, molybdenum, tantalum and tungsten in alloys with sufficient strength, corrosion resistance and high temperature performance for jet engine applications. (A4p, Q general, 2-12; Cb, Mo, Ta, W)

84-A. (German.) **New Developments in Nickel and Nickel Alloys.** W. Betteridge. *Metall,* v. 11, Jan. 1957, p. 24-28.

Nickel plating, special quality nickel, nickel-copper alloys, nickel-chromium alloys, high fatigue test nickel-alloys, nickel-molybdenum alloys, sinter metals. 9 ref.
(A general; Ni)

85-A. (German.) **Present State and Anticipated Development of the Iron Ore Supply.** Eugen Plotzki. *Stahl & Eisen,* v. 76, Dec. 27, 1956, p. 1728-1734.

Development of iron ore production of the world. Increase of iron ore production corresponding to production of pig iron in America. Limits of the increase of ore mining in Europe. Examples for the possibilities of the future ore supply.
(A11a, A4p; Fe, RM-n)

86-A. Metallurgical Topics. *Engineer,* v. 202, Dec. 28, 1956, p. 922-923.

Scoring and surface damage; metallurgical uses of sodium and beryllium copper.
(A general; Na, Cu, *Be*)

87-A. Improvements in Hot Rolled Grain-Oriented Transformer Sheet. A. Muhlinghaus. *Engineers Digest,* v. 17, Dec. 1956, p. 506-508. (From *Elektrotechnische Zeitschrift (ETZ),* Ausgabe A., v. 77, no. 20, Oct. 11, 1956, p. 732-736.)

Previously abstracted from original. See item 221-V, 1956.
(A general; SGA-n)

88-A. Titanium Industry Review for 1956. T. W. Lippert. *Industrial Heating,* v. 24, Jan. 1957, p. 38, 40, 44. (CMA)

Prices were cut and production increased in the titanium industry in 1956; 5300 tons of mill products were produced, with a market value of \$130 million. A total of 14,500 tons of sponge was produced; the leading producer was TMCA. Two new ingot melting firms are Harvey Machine Co. and the Oregon Metallurgical Corp. Cramet merged with Republic Steel during the year. Japanese firms exported 1750 tons of sponge to the U. S. in 1956. Electrolytic winning of titanium continues to show promise, but all commercial producers use magnesium or sodium reductants.
(A4p, C general; Ti)

89-A. Foundry Dust Control. VII. E. Bradley. *Industrial Heating Engineer,* v. 18, Jan. 11, 1957, p. 359-361.

Exhaust system for belt sander and disk sander. Layout of typical small pattern shop. To be continued.
(A8a, E17, 18-17)

90-A. How to Get More for Your Metalworking Dollar. 7. Aluminum. *Iron Age,* v. 179, Jan. 31, 1957, p. 58-72.

Aluminum alloys—characteristics, heat treatment, forging, casting, grinding, forming, welding, riveting, extruding, cleaning and finishing.
(A general; Al)

91-A. German Engineering Steels and Their British Equivalents. W. B. Kemmish. *Machinery,* v. 90, Jan. 11, 1957 p. 84-89.

Comparison charts and tables of German and British steels on strength basis. Brief explanation of German designation system. Characteristics of German direct-hardening and case-hardening steels are considered. (A general, 15-5, 15-6; ST)

92-A. Machine Searching of Metallurgical Literature. Allen Kent, Robert E. Booth and J. W. Perry. *Metal Progress,* v. 71, Feb. 1957, p. 71-75.

The research project, only a year old, has already formulated a coding system adaptable to machine feed for various commercial computers and electronic selectors, and several thousand metallurgical asbstracts have already been encoded and trial runs made on equipment constructed at Western Reserve University.
(A14e)

93-A. A Dictionary of Metallurgy. A. D. Merriman and J. S. Bowden. *Metal Treatment and Drop Forging,* v. 24, Jan. 1957, p. 21-28.

From "Vicalloy" to "Welding". To be continued. (A general, 11-17)

94-A. Uranium Ores: Their Occurrence and Treatment. S. W. F. Patching. *Nuclear Power,* v. 2, Jan. 1957, p. 12-17.

Important minerals and ore types; physical methods of concentration; world distribution of uranium.
(A11a, B14; U, 14-9)

95-A. Mount Wright Gold Deposit, Ravenswood. T. H. Connah. *Queensland Government Mining Journal,* v. 57, July 20, 1956, p. 529-535.

Evaluation of the low-grade ore body at Mount Wright.
(A11a; Au, 14-9)

96-A. Carbide Metallurgy Simplified. E. V. Anderlite. *Tooling and Production,* v. 22, Feb. 1957, p. 95-98.

Analysis of the three principal groups of carbides—cast iron and nonferrous grades, steel grades, wear and die grades—from the point of view of the tool technician and the engineer. (A general; SGA-j, 6-19)

97-A. Monazite Placers on South Muddy Creek, McDowell County and Silver Creek, Burke County, North Carolina. L. A. Hansen and A. M. White. *U. S. Atomic Energy Commission RME*-3115, March 1954, 28 p. (CMA)

Areas of North Carolina were drilled and explored for monazite placers along South Muddy Creek, Silver Creek and the Catawba River. The mineral composites showed 23 and 32% ilmenite, 8 and 6% zircon, 0.5 and 2% rutile and 6.4% and 6.2% monazite, respectively, for South Muddy Creek and Silver Creek. Map included. (A11a; Ti, Zr, 14-9)

98-A. Monazite Placer at the Junction of the North Tyger River With the Middle Tyger River, Spartanburg County, South Carolina. L. A. Hansen and N. P. Cuppels. *U. S. Atomic Energy Commission, RME*-3117, Jan. 1955, 23 p. (CMA)

Flood plain placers on the Tyger Rivers were explored. The minerals were estimated in one at 6570 tons of monazite, 51,200 tons of ilmenite, 2100 tons of rutile and 13,400 tons of zircon, with the heavy mineral content averaging 9.35 lb. per cu. yd. of alluvium. (A11a; Ti, Zr)

99-A. Potential of Heavy-Mineral-Bearing Alluvial Deposits in the Pacific Northwest. A. J. Kaufman, Jr., and K. D. Baber. *U. S. Bureau of Mines, Information Circular* 7767, Dec. 1956, 36 p.

Occurrences and reserves are listed for Idaho, Montana and Washington. Titanium, hafnium, rare earth metals, thorium, columbium and tantalum are emphasized. 13 ref. (A11a; Ti, Hf, Th, Cb, Ta, EG-g, 14-9)

100-A. Steel Mill Reclaims Process Wastes in Chemical Treatment Plant. *Wastes Engineering,* v. 28, Jan. 1957, p. 36.

Installation of equipment; coagulants for steel mill wastes. (A8, 1-2; ST)

101-A. (Dutch.) **News of the Nickel World.** C. Vollers. *Metalen,* v. 12, Jan. 1957, p. 11-12.

International Nickel's expansion plans (385 million lb. of nickel per year in 1960) reviewed. (A4p; Ni)

102-A. (French.) **Metallurgy of Uranium.** G. Cabane. *Enérgie Nucléaire,* v. 76, Oct. 1956, p. 18-24.

Description of the properties of uranium. 52 ref.

(A general, P general, Q general; U)

103-A. (French.) **Titanium. Summary of American Experience.** *Métaux-Corrosion-Industries,* no. 376, Dec. 1956, p. 500-512. (CMA)

Survey of the metallurgy of titanium, the more important physical and chemical properties of titanium and its commercial alloys, and of their important applications in the U. S. These include their use by the Army and Navy and in the aeronautical and chemical industries. (A general; Ti)

104-A. (French.) **Raoul de Vitry.** *Revue de Métallurgie,* v. 53, Dec. 1956, p. 915-929. (CMA)

A lengthy review on titanium metlurgy covers the important titanium ores, the production and refining of the metal, the various crystal modifications of titanium, melting and casting procedures, the physical metallurgy and important properties (physical and chemical) of titanium and its commercial alloys, and major applications. 12 ref. (A general; Ti)

105-A. (French.) **Uses of Cobalt.** M. Urbain. *Revue Universelle des Mines, de la Mécanique, de la Métallurgie,* v. 99, Dec. 1956, p. 621-630.

Metallic cobalt used principally for production of refractory metals employed in construction of gas turbines, aircraft reaction motors; magnetic alloys for permanent magnets; cutting and drilling tools, abrasion-resistant materials. Powder metallurgy techniques frequently used in some of above applications. Cobalt oxides and salts often used in ceramics and enameling industry; in colored pigments and drying agents for paints and varnishes. 25 ref. (A general; SGA-h, Co, 17-7)

106-A. (French.) **Refractory Compositions of the Rare Earth Metals: Borides, Carbides, Nitrides and Sulfides.** F. Gaume-Mahn. *Société Chimique de France, Bulletin,* Nov.-Dec. 1956, p. 1862-1867. (CMA)

The refractory compounds formed by the rare earth metals and boron, carbon, nitrogen and sulphur, respectively, are reviewed. These compounds, particularly the borides and sulphides, are extremely stable and should find many interesting applications in the future. The melting points of the borides are about 2200° C., those of the sulphides about 2000° C. 28 ref.

(A general, P12n; EG-g, *B, C, N, S,* 14-18)

107-A. (German.) **Chemistry and Metallurgy of Zirconium.** H. O. Nicolaus.

Chemische Rundschau, v. 10, Jan. 3, 1957, p. 1-4. (CMA)

Outline of principal facts related to the technology of zirconium and hafnium. An introductory statistical section is followed by the description of ores and their treatment, the main phases of the metallurgical process, the separation of hafnium, and the refining of the metal. 24 ref. (A general; Zr, Hf)

108-A. (German.) **Fire Prevention During Welding.** *Zeitschrift für Schweisstechnik,* v. 47, Jan. 1957, p. 12-14.

A pamphlet has been worked out containing safety precautions. The worker has to sign a slip to verify that he has read the pamphlet and will obey the given instructions. (A7p, K general)

109-A. (Italian.) **Nickel and High Nickel Alloys for Pressure Vessels.** *Il Nickel,* Dec. 1956, p. 11-23.

Cold and hot forming, heat treatment and cleaning of materials under consideration. To be continued. (A general, T26q; Ni)

110-A. (Portuguese.) **Fiftieth Anniversary of Monel Metal.** Horace A. Hunnicutt. *ABM-Noticiario,* v. 10, Dec. 1956, p. 2-4.

History of Monel, starting with discovery in Canada of nickel-copper alloy in natural state; special characteristics, applications, variations. (A general, A2; Ni)

111-A. (Portuguese.) **Companhia Siderurgica Paulista—(COSIPA) (Paulist Steel Co.).** Arthur Noronha. *Engenharia, Mineracao e Metalurgia,* v. 24, Oct. 1956, p. 229-234.

Proposed new steelmaking facility to have joint government and private capital. Projected annual production of 300,000 tons of steel, to be achieved in four years. Reasons for locating works in Piassaguera; transport considerations; raw material sources. (A4; ST)

112-A. (Portuguese.) **Mineral Resources of the Mining Triangle.** Othon Henry Leonardos. *Engenharia, Mineracao e Metalurgia,* v. 24, Sept. 1956, p. 133-142; Oct. 1956, p. 219-226.

Parts II and III. Locations of deposits; analyses and comments on commercial possibilities of some. To be continued. (A11a)

113-A. (Portuguese.) **Iron and Steel Manufacture in Argentina.** Orlando Rangel. *Engenharia, Mineracao e Metalurgia,* v. 24, Sept. 1956, p. 145-154.

Facilities in plants existing and under construction; raw material requirements and supply; analyses of domestic iron ores; government program for manufacture of steel; consumption of iron and steel in Argentina from 1935 to 1948. 28 ref. (A4; Fe, ST)

114-A. (Portuguese.) **Brazilian Thorium Reserves.** Avelino Ignacio de Oliveira. *Engenharia, Mineracao e Metalurgia,* v. 24, Sept. 1956, p. 163-164.

Listing of known deposits. Studies being made to determine commercial possibilities. (A11a; Th)

115-A. (Portuguese.) **Brazilian Uranium Deposits.** Avelino Ignacio de Oliveira. *Engenharia, Mineracao e Metalurgia,* v. 24, Oct. 1956, p. 209-211.

Locations of known deposits. No known deposits with proven commercial possibilities, but bases exist for hope that such will be found. (A11a; U)

116-A. (Pamphlet.) **High Conductivity Copper Alloys.** 54 p. 1956. Copper Development Association, Pub. No. 51, 55 S. Audley St., London W. 1, England.

Fabrication, properties and applications of chromium, silver and tellurium copper. 51 ref. (A general; SGA-q, Cu, *Cr, Ag, Te*)

117-A. (Book.) **Minerals Yearbook, Metals and Minerals, Volume I, 1953,** U. S. Bureau of Mines, Washington 25, D. C. $4.50.

Covers mineral commodities, both metals and nonmetals, but exclusive of mineral fuels. Chapters on mineral technology, metallurgical technology and trends in technology and operations. (A4n; 14-9)

118-A. (Book.) **Manufacturing Methods and Processes.** Arthur C. Ansley. 561 p. 1957. Chilton Co., Chestnut and 56th Sts., Philadelphia 39, Pa. $12.50.

Developments in casting, stamping, forming, forging, extrusion, powder metallurgy, heat treating, finishing, inspection and automation. Designed for use of executives, engineers and production men. (A general, 1)

119-A. (Book.) **The Wire Industry Encyclopaedic Handbook.** 484 p. 1957. Wire Industry Ltd., 33 Furnival Street, London E.C.4, England.

Includes a review of the British wire industry for 1956, a directory of manufacturers and a comprehen-

sive dictionary of wire and metallurgical terms.
(A general; 4-11; 11-17)

120-A. (Book.) **Wrought Titanium.** 2nd Ed. 68 p. 1956. Imperial Chemical Industires, Ltd., London. (CMA)

The history and development of titanium is reviewed and the ICI nomenclature for alloys is given. Data are given for the physical and mechanical properties. The alloys Ti 318A (6% Al, 4% V), Ti 371 (13% Sn, 2.75% Al) and Ti 317 (5% Al, 2.5 Sn) are considered. Corrosion resistance data are tabulated, covering such agents as concentrated mineral acids, organic acids and aldehydes, halogens, metallic chlorides, salts and sea water. Recommendations are given for grinding, sawing, drilling, milling, planing, threading, hot working, descaling, electrodeposition, anodizing, forming, welding, brazing and soldering. Extensive weight-size tables for sheet, plate, wire, tubing and bar of variously shaped cross section are appended. (A general; Ti)

121-A. Trends in Air Pollution—1956. Wesley C. L. Hemeon. *Blast Furnace and Steel Plant,* v. 45, Feb. 1957, p. 204-208.

Developments of past four years of interest to the steel industry. Summary of A.I.S.I. research program. 7 ref. (A8; ST)

122-A. Operational Research in the Iron and Steel Industry. H. G. Jones. *Iron and Coal Trade Review,* v. 174, Jan. 11, 1957, p. 97-102.

Some of the points of contact between operational research and work study, tools of operational research, analysis of uncontrolled data and method study of machines.
(A9n; ST)

123-A. Molybdenum for High Strength at High Temperature. R. R. Freeman and J. Z. Briggs. *Jet Propulsion,* v. 27, Feb. 1957, p. 138-147. See also: **High-Temperature Strength Characteristics Indicate New Applications for Molybdenum Alloys.** R. R. Freeman and J. Z. Briggs. *Machine Design,* v. 29, Feb. 21, 1957, p. 137-138, 140, 142, 144. (CMA)

Molybdenum, of interest to missile and power plant designers, is available as four high-strength, high-temperature alloys: 0.5% Ti, 0.3% Nb, 1% V and 2% W. Physical properties are not much affected by alloying or processing, but mechanical properties are. Worked and stress-relieved Mo-0.5% Ti has the best high-temperature properties. Protective coatings may be the solution to oxidative attack; requirements of successful coats are enumerated. Molybdenum parts are produced by forging bar stock, but forming is best for ramjet parts. Minimizing embrittlement in welding is discussed. 7 ref.
(A general; Mo, SGA-h, SGB-a)

124-A. Further By-Product Minerals. *Mining Journal,* v. 248, Jan. 18, 1957, p. 81.

Sources and applications of rhenium, rubidium, scandium and tellurium. (A11a, T general, Re, Rb, Sc, Te, 14-9)

125-A. Century of Aluminum. George Boex and Stanley Robson. *Royal Institution of Great Britain, Proceedings,* v. 36, Part I, no. 162, p. 70-105.

Historical review, with emphasis on applications of aluminum and changing market conditions over the years. 14 ref. (A2, T general; Al)

126-A. Ideas for Waste Treatment. *Steel,* v. 140, Feb. 18, 1957, p. 150-154.

Efficient and safe methods of treatment or disposal for acids, alkalies, heavy metals, cyanides or miscellaneous other wastes are receiving increasing consideration from industry in effort to reduce costs. (A8)

127-A. (French.) **Interesting Possibilities Offered by Titanium, a Light-Weight Material With High-Quality Mechanical Performances.** G. Grandvoinnet. *Revue Générale de Mécanique,* v. 41, Jan. 1957, p. 19-22. (CMA)

Properties, metallurgy and costs of production of titanium briefly outlined, table is presented giving names, composition, thermal treatment and characteristics of nine titanium alloys manufactured or to be manufactured in 1957 in France.
(A general; Ti)

128-A. Titanium in Canada—1956. T. H. Janes. *Canadian Mining Journal,* v. 78, Feb. 1957, p. 130-132. (CMA)

A survey of world titanium ore resources, ilmenite deposits, production and shipments from Lake Allard, titanium pigment industry in Canada and the U.S., Canadian fabrication and working of titanium. Kennecott Copper-Allied Chemical and Dye project to produce $TiCl_4$ and titanium metal is of interest in Canada because titaniferrous slag from Lake Allard may be a raw material.
(A general; Ti)

129-A. Stainless Steel From the User's Point of View. H. J. Wilson. *Chemical and Process Engineering,* v. 38, Jan. 1957, p. 5-10.

Types, problems of design and construction, corrosion and abrasion resistance. Some examples of stainless steel construction.
(A general; SS)

130-A. Metallurgy. H. A. Holden. *Chemical and Process Engineering,* v. 38, Jan. 1957, p. 15-18.

Review of the development and uses of steel, magnesium, titanium and other miscellaneous metals. 58 ref. (A general)

131-A. Titanium From a Business Standpoint. H. H. Kellogg. *Metal Progress,* v. 71, Feb. 1957, p. 128, 130, 132. (From *Engineering and Mining Journal,* v. 156, Apr. 1955, p. 72-84.) (CMA)

Various problems noted: solid solution of the oxide in the metal, high price, limited supply, selection of best process. It is predicted that titanium mill products will sell for $2 per lb. when the industry is mature. Kroll process sponge and ingots will be available at $1.15 to $1.30 per lb. (A4s; Ti)

132-A. Long-Term Outlook for Copper. Robert P. Koenig. *Mines Magazine,* v. 47, Jan. 1957, p. 16-18, 32.

Increased demand for primary products, prospects for improved copper supplies, dynamics of copper-consuming industries and prospects for increased copper demand.
(A4p; Cu)

133-A. Titanium 1956-1957. C. U. Bradford. *Mining Congress Journal,* v. 43, Feb. 1957, p. 113-114. (CMA)

Notable occurences in the titanium industry in 1956 included a 300% leap in demand due to use in several types of aircraft. Melting capacity has been increased by the four major fabricators of titanium, and research programs made great progress. Many new uses were developed in chemical process industries. By the end of 1957 sponge capacity is expected to be 36,500 tons yearly.
(A general; Ti)

134-A. Zirconium Arrives. *Steel,* v. 140, Feb. 25, 1957, p. 56-57. (CMA)

Zirconium has both nuclear and commercial applications, but the best chance of a rapid industrial expansion is with the former. Delivery of the hafnium-free nuclear grades will rise sharply in 1957 as new plants begin production (i.e., Carborundum Metals, U.S. Industrial Chemicals, NRC Metals and Wah Chang Corp.). Cost and capacity figures presented. (A4p; Zr)

135-A. Mineral-Dressing Study of Manganese Deposits of the Batesville, Ark., District. M. M. Fine. *U.S. Bureau of Mines, Report of Investigations* 5301, Jan. 1957. 12 p.

Research on manganese-bearing limestone indicates that this resource constitutes one of the major domestic reserves. Ferrograde concentrates can be recovered from the samples tested. (A11a, B11; Mn)

136-A. (French.) **Fluctuations of World Production of Nickel and Their Effect on Special Steels.** André Michel. *Métallurgie et la Construction Mécanique* v. 89, Jan. 1957, p. 33-41.

Problems arising from the nickel shortage. Maintains that nickel can be saved in the manufacture of stainless steel and refractory steel by substitution of chromium or by keeping it to the austenitic structure, either by acting on the nitrogen content or by the use of manganese. Contains detailed descriptions of chromium-nickel and chromium-manganese-nickel stainless steels.
(A11b; Ni, SS)

137-A. (French.) **Aluminum Situation at the Beginning of 1957.** André Dumas. *Revue de l'Aluminium,* no. 239, Jan. 1957, p. 45-47.

Unique properties of aluminum; widespread domestic and industrial applications; progress in production techniques; figures indicating extent of French production; expansion prospects as seen by the manager of L'Aluminium Francais.
(A general; Al)

138-A. (German.) **Austrian Uranium Sources and Their Outlook.** Heinz Meixner. *Berg und Hüttenmannische Monatshefte,* v. 101, Nov. 1956, p. 223-228.

Geographical distribution of different uranium ores in Austria. 21 ref. (A11a; U)

139-A. (German.) **Metallurgy of Beryllium.** Willy Schreiter. *Freiberger Forschungshefte,* v. B17, Oct. 1956, p. 50-77.

Mining of ore, extraction of metallic beryllium, preparation of beryllium-copper alloy, smelting, sintering, beryllium oxide, beryllium carbide, application in atomic energy as moderator and reflector, toxicology. 30 ref. (A general; Be)

140-A. (Italian.) **Achievements and Objectives of Italian Metallurgy in**

the Nonferrous Field. C. Panseri. *Metallurgia Italiana,* v. 48, Dec. 1956, p. 561-574.

Copper, zinc, lead, silver, cadmium, aluminum production and principal methods of refining used; perspectives for fulfilling more of domestic requirements. Tables and other data on prices, production, consumption, export-import.
(A4p, C general; EG-a38)

141-A. (Japanese.) **Borides, Carbides, Silicides, and Nitrides.** Tadao Tomonari. *Chemical Society of Japan, Journal, Industrial Chemistry Section,* v. 59, Nov. 1956, p. 1272-1278. (CMA)

Rare element compounds of boron, carbon, silicon and nitrogen which are stable and which form solid solutes are listed, and their crystalline classifications are given. Preparation methods, properties and uses reviewed. 15 ref.
(A general; EG-b, 14-18)

142-A. (Japanese.) **Purity of Selenium and Its Application.** Takeo Nakogawa. *Denki Kagaku,* v. 24, Nov. 1956, p. 529-533.

Properties, refining and application of selenium. 15 ref.
(A general; Se)

143-A. (Russian.) **Problem of the Toxicity of Metallic Magnesium.** E. M. Kakauridze, P. F. Labadze and T. A. Kakuliya. *Gigiyena i Sanitariya,* v. 21, Nov. 1956, p. 73-74.

Results of clinical observation of a number of workers employed at a shop where parts from magnesium alloys containing 89.7 to 91.65% of metallic magnesium were manufactured. All the workers examined suffered from dryness in the nasopharynx area, frequent catarrh, loss of hair, dry skin and scabies.
(A7; Mg)

144-A. Production and Fabrication of New AISI Types 201 and 202. G. W. Hinkle. *ASTM Bulletin,* no. 220, Feb. 1957, p. 47-50.

Melting procedure, blooming mill operation, forging, machining, annealing, pickling, roll forming, deep drawing, polishing, welding and stress cracking of AISI 201 and AISI 202 alloys (low nickel stainless steels). (A general; SS)

145-A. Uranium in Canada—1956. R. A. Simpson. *Canadian Mining Journal,* v. 2, Feb. 1957, p. 129-130.

Occurrence, mining, uses and future of uranium in Canada.
(A general; U)

146-A. Titanium in the Aircraft Industry. *Engineer,* v. 203, Feb. 22, 1957, p. 295-297.

Imperial Chemical Industries called a conference of representatives of the British government and aircraft industry. Industrial statistics were quoted. The wrought titanium forms available to the aircraft industry were described and considered. Subjects covered at the conference were stress specifitions, formability, scrap reclamation, fatigue in titanium tubes, development of high-strength sheet alloys. British sales of titanium are analyzed. (A general, T24; Ti)

147-A. Mineral Wealth of India. G. G. K. Sastri. *Indian Minerals,* v. 10, July-Sept. 1956, p. 220-232.

Mineral resources of India classified under metallic minerals, nonmetallic minerals, mineral fuels and atomic minerals. Among Indian minerals of world importance are mica, iron ore, manganese ore, ores of aluminum, magnesium, titanium, high-grade refractories, thorium and other atomic minerals. (A11a; 14.9)

148-A. Special Cutting Table "Clears the Air". *Industry and Welding,* v. 30, p. 82-84.

Colonial Iron Works, Cleveland, Ohio, solves problem of removal of smoke produced by the powder burning process used in the torch cutting of metals. (A8a, G22g)

149-A. Titanium: Are Prices Coming in Reach? G. J. McManus. *Iron Age,* v. 179, Feb. 28, 1957, p. 40-41. (CMA)

Cost cutting in the titanium industry is now taking the form of increased scrap use: Rem-Cru has installed a furnace which will remelt scrap and Mallory-Sharon is developing a method of electrolytically refining scrap. Titanium is emerging as a separate industry with its own rolling and fabricating facilities as evidenced by new TMCA equipment. A tight titanium supply last December caused the Air Force to supervise distribution. About 70% of titanium for military use goes to jet engines and 25% to airframes.
(A4s, B23; Ti)

150-A. Technical Development in the Steel Industry: Some Lessons From Sweden. D. J. O. Brandt. *Iron and Coal Trades Review,* v. 174, Jan. 25, 1957, p. 197-200.

Considerable difficulties have had to be surmounted in obtaining adequate supplies of fuel in Sweden.

The author considers some of these difficulties, and suggests that overcoming them has bred a fine tradition of enterprise and inventiveness which are worth emulating; the fuel problem, sponge-iron process and Swedish research organization are described. (A11a, A9, D8j; ST, RM-j)

151-A. New Cutting Steels. *Mass Production,* v. 33, Feb. 1957, p. 68-71.

New Wimet cutting steels "XL2" and "XL3" extend the range of grades with extended wear.
(A general, Q9n; ST, SGA-j)

152-A. The Aluminum Supply Position. E. G. West. *Metallurgia,* v. 55, Feb. 1957, p. 55-62; disc. p. 90.

Summary of recently published information on ingot capacity. Production and consumption in principal countries. Increasing tendency to establish smelters near the raw material deposits on which trend nuclear power may have considerable bearing. (A4p; Al)

153-A. High Strength Aluminum Casting Alloy 40-E:D.T.D.5008: Latest Developments and Foundry Experience. J. F. Gardner and M. R. Hinchcliffe. *Metallurgia,* v. 55, Feb. 1957, p. 79-84.

Alloy employs zinc, magnesium, chromium and titanium as alloying constituents. An outline of the properties is given. Melting and casting characteristics, typical applications.
(A general, E general; Al, SGB-a)

154-A. Special Metals and Rare Earths. Eugene B. Hotchkiss. *Mining Congress Journal,* v. 43, Feb. 1957, p. 76-78.

Availability and importance of the rare earths and a number of other metals, including zirconium, beryllium and uranium.
(A11a; EG-g, Zr, Be, U)

155-A. Titanium—1956-57. C. I. Bradford. *Mining Congress Journal,* v. 43, Feb. 1957, p. 113-114.

The use of titanium tripled in 1956, new applications being heat exchangers, reactors, mixers, pumps, valves and marine hardware. Important research on cold mold and unconventional melting is also cited.
(A general, T general; Ti)

156-A. (French.) **Some Generalities on Titanium and Its Metallurgy.** Marcel Fourment. *Société Royale Belge des Ingénieurs, Revue,* no. 2, Feb. 1957, p. 51-61. (CMA)

Outline of the main facts concerning the properties, ores and metallurgy of titanium. The section on metallurgy mentions two procedures for refining metallic titanium: the method of thermal dissociation of titanium iodide, and the method of progressive liquation of titanium bars. (A general, C1p, C28k; Ti)

157-A. (Italian.) **Past, Present and Future of the Italian Steel Industry.** A. Scortecci. *Metallurgia Italiana,* v. 48, Dec. 1956, p. 545-560.

Production of iron and steel in Italy from Roman times to present. Development of steelmaking techniques, with table of important dates (world-wide) in history of iron and steel. Problems of coke supply, utilization of "poor" metals, blast furnace developments in main steel producing countries of the world. Economic aspects and importance of professional personnel. 24 ref.
(A2, P4, D general; ST)

158-A. (Book.) **Tool and Die Steels Handbook.** 1956. Jessop-Saville, Sheffield, England, 79 p.

Contains information for the toolmaker relative to the composition, characteristics, quality and properties of specialized steels used in tool and die operations. (A general; TS)

159-A. (Book—French.) **Study and Design of Light Alloy Structures.** J. Reinhold. 248 p. 1955, Librairie Polytechnique Ch. Beranger, Paris, France.

Outlines physical, chemical, electrical and mechanical properties of aluminum and its alloys indicating the principal applications of each alloy; analyzes in detail the mechanical principles underlying aluminum structural design such as shearing stress, failing stress, shape factors and radius of gyration; concludes with a sketch of the casting, working, welding and finishing of aluminum and light alloys. (A general, Q general, 17-1; Al, SGB-s)

160-A. (Book—Italian.) **A Biography of Metals.** Felice de Carli. 269 p. 1956. Casa Editrice Dr. Francesco Vallardi, Milan, Italy.

Story of metals from earliest known uses and workings to present day, written for the layman. Emphasis on influence of metals on man and his environment, and of man's needs on development of metallurgical sciences. Basic information on technological aspects.
(A general)

161-A. Health Aspects of Welding. Humphrey Davy. *American Society of Naval Engineers, Journal,* v. 69, Feb. 1957, p. 76-80.

Suggested precautions and improvements of welding methods from the viewpoint of health. Low hydrogen method, submerged-arc welding, inert-gas metal-arc process, atomic-hydrogen process, carbon arc welding and brazing are discussed. 18 ref. (A7p, K1, K8)

162-A. Now Titanium Is Cheaper: Its Properties and Uses. *Engineering,* v. 183, Mar. 8, 1957, p. 298-300 (CMA)

The titanium products of ICI sell at 19s 6d, the lowest price in the world. The price of titanium has been halved in three years and world production is expected to exceed 30,000 tons in 1957. Other information on titanium extraction, melting, alloying, working and research was presented in papers read at the recent "Titanium in the Aircraft Industry" conference. Also discussed were corrosion and creep, galling and present uses. (A general; Ti)

163-A. Challenge of Titanium. *Iron and Steel,* v. 30, Mar. 1957, p. 85 +. (CMA)

Status of titanium and its technology in industry. Physical properties, fabrication, welding, brazing and machining. Supply, sponge production, and the direction of demand. Titanium may become competitive with stainless steel but will probably never be competitive with mild steel. (A general; Ti)

164-A. Scrap and Residues. S. W. Platt. *Metal Industry,* v. 90, Feb. 1957, p. 123-126.

Main sources of scrap; copper, tin, lead, zinc, cadmium, bismuth, white metals, solders, type metals, aluminum, magnesium and nickel, their segregation and treatment.
(A11d; Cu, Sn, Pb, Zn, Cd, Bi, Al, Mg, Ni, SGA-d, SGA-f, RM-p)

165-A. Dictionary of Metallurgy. A. D. Merriman and J. S. Bowden. *Metal Treatment and Drop Forging,* v. 24, Feb. 1957, p. 73-80.

Section from "Weirzin to X-Ray Spectra". (To be continued.)
(A general, 11-17)

166-A. Titanium Ores—the Present Picture. R. Quirk. *Mining Congress Journal,* v. 43, no. 3, March. 1957, p. 70-72. (CMA)

Titanium deposits are classified as rock deposits and beach sand deposits. Both may be exploited for ilmenite, but the rock deposits have an economic advantage in the salable iron ore products. Finnish, Norwegian, Canadian and New York rock deposits now worked are noted. Of prime importance in evaluating these deposits is suitability for the manufacture of titanium dioxide pigments. Beach sands depend for their value mainly on the rutile content. Australian, Indian and Floridian beach deposits are noted. (A11a; Ti, RM-n)

167-A. Safety Considerations for the Rolling of Uranium Sheet. James G. Stearns. Los Alamos Scientific Laboratory. *U. S. Atomic Energy Commission,* LA-2059, Dec. 1956, 10 p.

With regard to safety, the rolling of either normal or depleted uranium is the same; however, in addition to any safeguards applied to normal or depleted uranium, another factor, nuclear safety, must be considered when enriched uranium is rolled. Essentially, nuclear safety is the control of weight, shape and tamping factors of enriched uranium. In the preparation for and the allied equipment to be used with rolling processes, considerable planning must be carried out.
(A7p, A7r, F23; U)

168-A. Semi-Annual Summary Research Report in Metallurgy for January-June, 1956. Iowa State College. *U. S. Atomic Energy Commission,* ISC-759, Jan. 8, 1957, 42 p.

Purification and separation studies; alloy systems; metal coatings and corrosion; solid state investigations. (A general, A9)

169-A. Summaries of Physical Research in Metallurgy, Solid State Physics, and Ceramics. Edward Epremian. *U. S. Atomic Energy Commission,* TID-4005. Jan. 1957, 137 p.

Abstracts of papers in the following areas: (1) production, treatment, and properties of materials; (2) alloy theory and nature of solids; (3) radiation effects on materials. (A general, N general, P18, 2-17)

170-A. (French and German.) **Information and Research Relating to the Applications of Tin.** B. Keysselitz. *Pro-Metal,* no. 55, Feb. 1957, p. 771-778.

Organization, aims and activities of the international Tin Research Council; enumeration of the properties and uses of tin; electrolytic deposition of tin and its alloys; excellent protection afforded by such

coatings against corrosion; use of tin in the new copper alloys such as copper-tin-beryllium.
(A general; Sn, 17-7)

171-A. (French.) **Evolution of the Use of Molybdenum in the French Iron and Steel Industry.** L. Colombier. *Métallurgie et la Construction Mécanique,* v. 89, Feb. 1957, p. 105-111.

Three groups of molybdenum steels are currently used, structural steels, stainless steels and refractory steels. Outlines resistance of stainless steels to various reagents, behavior of refractory steels at high temperatures and indicates the improvements achieved by the addition of molybdenum in hardenability, resistance to annealing and reduction of brittleness.
(A general; AY, SS, SGA-h, *Mo*)

172-A. (Italian.) **Review of Principal Characteristics of Spheroidal Cast Iron. Part I.** Domenica Mensa and Matio Noris. *Ingegneria Meccanica,* v. 5, June 1956, p. 41-49.

Brief review of most important patents covering manufacture on a commercial basis. Metallurgical description of types most commonly used in mechanical construction. Physical and mechanical characteristics, with emphasis on most advantageous applications and economic aspects. (To be continued.)
(A general; CI-r)

173-A. Pearlite Malleable Iron in Canada. *Canadian Metals,* v. 20, Mar. 1957, p. 54-58.

Definition of properties, applications, method of manufacture and equipment used by International Malleable Iron Co. (A general; CI-s)

174-A. Transporation Control in Steelmaking. J. L. Kerins. *Iron and Steel Engineer,* v. 34, Mar. 1957, p. 134-137.

Transportation controls have resulted in improvement to many material handling methods and to extended use of special equipment. These controls have become preeminent as tools by which management plans, develops and installs dependable and efficient operating techniques that supply it with lowest cost transportation service.
(A5b, W12; ST)

175-A. Titanium Industry in U.S.A. in 1956. T. W. Lippert. *Light Metals,* v. 20, Feb. 1957, p. 59-60.

1956 was characterized by steeply declining prices and record-breaking production volume. Industry continues to search for new extractive procedures. (A4p, C general; Ti)

176-A. The Long Struggle to Make Malleable Platinum. M. Schofield. *Metallurgia,* v. 55, Mar. 1957, p. 137-139.

Brief report of 400-year history of platinum with particular reference to work of Chabaneau and Wollaston. (A2; Pt)

177-A. Common Aluminum Alloys. M. W. Hall. *Modern Metals,* v. 13, Mar. 1957, p. 68-72.

Subjects discussed about nonheat treatable alloys include meaning of temper symbols, alloy designations, available forms, weight versus volume, work hardening, annealing and where to use various alloys.
(A general, S22; Al)

178-A. Air Force Materials Research and Development Program. H. E. Hines and R. F. Walden. Wright Air Development Center. *U.S. Office of Technical Services,* PB 111648-S2, Oct. 1956, 94 p. $2.50.

Research in adhesives, metallurgy, analysis and measurement, biochemistry, textiles, petroleum products, plastics, packaging, protective treatments and rubber.
(A general, T24, 17-7)

179-A. New High Temperature Intermetallic Materials. (Pt. 1). William Arbiter. American Electro Metal Corp. (Wright Air Development Center), *U.S. Office of Technical Services,* PB 111413, May 1953, 91 p. $2.

Details of preparation and testing of intermetallic compounds. A composition whose starting components were 95% chromium titanide and 5% chromic sesquioxide showed promising high-temperature properties, including good oxidation resistance and high stress-to-rupture strength.
(A general; Cr, Ti, 14-18, SGA-h)

180-A. New High-Temperature Intermetallic Materials. (Pt. 2). William Arbiter. American Electro Metal Corp. (Wright Air Development Center), *U.S. Office of Technical Services,* PB 121018, Nov. 1953, 55 p. $1.50.

Details of preparation and evaluation of a large number of intermetallic compounds, some hard metal compounds and combinations of both. Compounds in the system titanium and silicon showed promise as potential high-temperature materials with excellent oxidation resistance at elevated temperatures.

Chromium materials exhibited excellent stress-to-rupture behavior.
(A general; Ti, Si, Cr, 14-18, SGA-h)

181-A. (Book.) **Metallurgical Information Meeting, Ames Laboratory, Iowa State College, May 2, 3, and 4, 1956.** Iowa State College. *U.S. Atomic Energy Commission,* TID-7526 (Pt. 1), Feb. 1957, 281 p.

Papers abstracted separately.
(A general)

182-A. (Pamphlet—French.) **General Information on Aluminum and Its Alloys.** 47 p. 1955. *L'Aluminium Francais,* 23 Rue Balzac. Paris 8, France.

Method of symbolic designation of aluminum and its alloys; physical properties of aluminum compared with those of copper and iron; mechanical characteristics; chemical properties of aluminum; resistance to corrosion; principal commercial forms of aluminum and its alloys; information as to thickness and weight of such pieces; heat treatment. (A general; Al)

183-A. (Book—French.) **Metallurgy, Vol. II.** R. Cazaud. 202 p. 1957. Dunod, 92 Rue Bonaparte, Paris 6, France.

Concise pocket-pook covering many aspects of metallurgy. Subjects range from various methods of casting, rolling, stamping and drawing to heat treatment, methods of testing metals (mechanical tests, corrosion tests, microscopic metallography), analysis of the mechanism of corrosion, oxidation and protective coatings. (A general)

184-A. (Pamphlet—Spanish.) **Papers Presented at the 28th International Congress of Industrial Chemistry.** Institute for Scientific Studies, Juan de la Cierva Foundation for Scientific Study, Barcelona, 1956. 20 p.

Three papers abstracted separately. (A general)

185-A (Book—Spanish.) **Papers Presented at 3rd General Assembly of the Iron and Steel Institute.** Institute for Scientific Studies, Juan de la Cierva Foundation for Scientific Study, Barcelona, Spain. 1956. 37 p.

Papers abstracted separately.
(A general; ST)

186-A. Working With Manganese. W. Schweisheimer. *Australasian Engineer,* no. 45, Feb. 7, 1957, p. 86-88.

Observations on conditions causing manganese poisoning, symptoms of poisoning and control measures.
(A7q; Mn)

187-A. Main Metal: Light Alloy for Casting and Extrusion. *Australasian Manufacturer,* v. 41, Feb. 9, 1957, p. 72-81.

Composition, properties and applications of main metal (zinc-aluminum alloy).
(A general; Zn, Al, 4-8, 5)

188-A. How Much Manganese to Malign? W. Schweisheimer. *Canadian Machinery,* v. 68, Mar. 1957, p. 114-115.

Manganese poisoning and steps necessary for its prevention.
(A7q, Mn)

189-A. New Method for Eliminating Poisons From the Effluents of Hardening Plants and Plating Shops. Werner Peters. *Draht (English Edition),* no. 27, Feb. 1957, p. 34-38.

Lancy process based on adequate preliminary rinsing followed by neutralization prevents toxic chemicals from reaching effluent waters; process details for chromate and cyanide wastes. (A8b)

190-A. Titanium. R. L. Preece. *Inspection Engineer,* v. 20, May-June 1956, p. 61-63, 71. (CMA)

Occurrence, physical and mechanical properties, corrosion resistance, processing, fabrication, electrodeposition, welding and brazing of titanium are reviewed. (A general; Ti)

191-A. A Castable High-Strength Aluminum Alloy. *Precision Metal Molding,* v. 15, Mar. 1957, p. 48, 58.

North American Aviation has developed a new castable alloy for aircraft use with an ultimate tensile strength of 46,000 psi. and a tensile yield of 36,000 psi. The new material, known as 42B, is similar in composition to alloy 356.
(A general, E25p, Q27a; Al)

192-A. New—A High Strength Stainless Alloy. *Precision Metal Molding,* v. 15, Mar. 1957, p. 63, 87-88.

Development of a new castable alloy, tentatively designated as CD-4MCu, possessing both excellent mechanical properties and the same corrosion resistance characteristics of 18-8 stainless steel.
(A general, E25p, Q general; SS)

193-A. Iron Ore Resources of New Zealand. J. Luke. *New Zealand Department of Scientific and Industrial Research,* Information Series—Bulletin 6, 1955, 28 p.

Reserves of iron-sand, limonite

and ilmenite ore tabulated.
(A11a; Fe, RM-n)

194-A. (French.) **A New Type of Copper With Phosphorus.** *Cuivre Laitons Alliages,* no. 35, Jan.-Feb. 1957, p. 35-37.

Deoxidized copper with phosphorus is particularly well qualified for brazing and welding, possesses such advantages as greater speed in hot and cold working. Consideration of electrical conductivity and annealing temperature as functions of phosphorus content.
(A general; Cu, *P*)

195-A. (French.) **Management of Scrap.** J. Pennel. *Cuivre Laitons Alliages,* no. 35, Jan.-Feb. 1957, p. 39-44.

Sorting and storing of scrap according to type of metal, nature of pieces (welded, brazed, chromium-plated, etc.), form (sheets, bars, tubes); elimination of ferrous metals; preparation of scrap for pressing; methods of transferring scrap; wooden cases are compared with sacks as vehicles of conveyance.
(A11d, S10; RM-p)

196-A. (French.) **Report on Iron and Steel. (Annual Review: Evolution of Production and Investments).** G. Grenier. *Echo des Mines et de la Metallurgie,* Jan. 1957, p. 23-25.

Survey of iron and steel production and investment up to the end of 1955; preparation of ores in the United States, European countries and the Soviet Union; blast furnace capacities and methods of blasting; new techniques and recent progress in the steel industry, enumeration and description of new processes.
(A4p, D general; ST)

197-A. (French.) **Electrical Energy and Aluminum.** *Journal du Four Eléctrique,* no. 6, Nov-Dec. 1956, p. 193-194.

In the United States the aluminum industry consumes approximately 5% of the total electrical energy produced; consideration of the connection between electrical consumption and aluminum production and the possibilities of the use of other sources of energy such as coal and natural gas. (A11, 16-11; Al)

198-A. (French.) **Development of the Aluminum Industry in the U.S.S.R.** *Journal du Four Eléctrique,* no. 6, Nov-Dec. 1956, p. 211.

Predictions concerning the possible evolution of the Russian aluminum industry in the foreseeable future. The Soviet government has announced its intention of raising aluminum production, by 1960, to the 1,200,000 (metric) tons per year level. The Soviet Union is expected therefore to move ahead to second place among the world's aluminum-producing countries. (A4p; Al)

199-A. Metallurgy at Canada's "Mines Branch". Harold J. Roast. *Metal Progress,* v. 71, Apr. 1957, p. 74-77.

Fifty years ago a research organization was authorized by the Canadian Government. Now its personnel numbers over 600 in the six divisions, of which 146 are in physical metallurgy—a term broad enough to include foundry practices on the one hand and super-purity metals on the other. (A9h)

200-A. A Dictionary of Metallurgy. A. D. Merriman and J. S. Bowden. *Metal Treatment and Drop Forging,* v. 24, Mar. 1957, p. 107-114.

From "xenon" to "zwitter ions".
(A general, 11-17)

201-A. Copper and Copper Alloys. A Survey of Technical Progress During 1956. E. Voce. *Metallurgia,* v. 55, Mar. 1957, p. 109-120.

Outlines principal publications dealing with copper and copper alloys during 1956 in following fields: raw material resources, extraction, foundry practice, forming or working processes, finishing, plating, sheet treating, mechanical properties, applications, corrosion, joining, powder metallurgy, physical properties, inspection, testing and analysis. 276 ref. (A general; Cu)

202-A. The Metal of the Future. A. D. McQuillan. *New Scientist,* Feb. 21, 1957, p. 29-31. (CMA)

Review of the history, occurrence, importance and present industrial status of titanium. The Wilton plant of ICI is described; a sodium reduction process is carried out in the presence of a protective atmosphere. (A general, C26; Ti)

203-A. Zirconium and Hafnium. A Bibliography. Gordon C. Williams, E. G. Baker, Jr., E. W. Holzknecht and R. G. Moody. University of Louisville. *U.S. Atomic Energy Commission,* NYO-1003, May 1950, 236 p.

Result of a thorough search of *Chemical Abstracts* from 1907 through 1948. Includes an almost complete listing of all references to either zirconium or hafnium appearing therein. (A general; Zr, Hf)

204-A. Comprehensive Report of Exploration by the Bureau of Mines for Thorium and Radioactive Black Mineral Deposits. D. E. Eilertsen and F. D. Lamb. Bureau of Mines. *U.S. Atomic Energy Commission,* RME-3140, June 1956, 46 p.

Exploration work done on 49 projects located in Western and Northwestern U.S. including Alaska (39) and Southeastern U.S. (10). All deposits investigated were placers except one, in Wyoming, which is a lode deposit. (A11a; Th, 14-9)

205-A. Bibliography of Zirconium. E. Abshire. *U.S. Bureau of Mines Information Circular* 7771, Mar. 1957, 281 p. (CMA)

An exhaustive bibliography of the literature published from 1907 to date for zirconium and hafnium. Some 645 patents and 969 journal references with abstracts are included. Reference sources used are enumerated. The journal and patent sections are arranged alphabetically by authors and followed by subject indexes, secondary authors are cross-indexed. (A general; Zr)

206-A. Hazards and Safety Precautions in the Fabrication and Use of Titanium. F. D. Peterseim. Battelle Memorial Institute, Report 63. *U.S. Office of Technical Services,* PB 121623. Jan. 1957, 25 p. (CMA)

Producers, fabricators and users of titanium were contacted and a literature survey was made to determine the degree of hazard with titanium. The discussion covers fire hazards in processing and preparing titanium, reactions with nitric acid, storing and handling sponge, and the explosive aspects of titanium powder. (A7p; Ti)

207-A. The Hot Forming, Assembly and Service Applications of Magnesium Alloys. R. G. Wilkinson. *Welding and Metal Fabrication,* v. 25, Mar. 1957, p. 101-107.

Mechanical properties and chemical compositions of common magnesium wrought alloys including die materials, preforming considerations, forming operations, mechanical joining, welding and adhesive bonding, surface protection and applications. 9 ref. (A general; Mg)

208-A. Progress in Western Metalworking. *Western Metals,* v. 15, Mar. 1957, p. 69-95.

Recently adopted methods and new development in metalworking industry in western U.S., including notes on casting, cutting, finishing, forging, forming, heat treating, machining, joining, testing and materials handling. (A general)

209-A. (French.) **Reflections on Works Organization for Fabrication by Welding With a View to Increasing Productivity.** G. Repeczky. *Soudage et Techniques Connexes,* v. 11, Jan.-Feb. 1957, p. 5-21.

Detailed analysis of welding processes from the point of view of productivity; notes the relative roles played by the design, production, planning and management departments; suggests rules and principles and various ways of calculating time and costs, together with methods of work to improve efficiency and lower costs.
(A5, A4s, K general)

210-A. (French.) **Activities of the Office Central et Institut de Soudure in the Field of Research.** A. Leroy. *Soudage et Techniques Connexes,* v. 11, Jan.-Feb. 1957, p. 39-45.

Outline of the research problems raised by the development of welding applications comprehending a considerable number of industries and techniques; consequent work undertaken on a joint basis or in liaison with other research centers at the national and international levels. (A9h, K9)

211-A. (German.) **Current Economic and Technological Situation in the Field of Titanium.** Richard Kieffer and Friedrich Benesovsky. *Berg- und Huettenmaennische Monatshefte,* v. 101, Dec. 1956, p. 292-300. (CMA)

Current prices of various titanium-containing products (titanium slag, rutile concentrate, titanium dioxide, etc.) and of various titanium ores. After a brief review of the historical development of titanium metallurgy and of the present state of industrial titanium production, future possibilities of cheaper procedures are discussed. 9 ref.
(A4s, C general; Ti, RM-n)

212-A. (German.) **Some Problems of Research on New Light Metal Alloys.** D. A. Petrov. *Acta Technica Academiae Scientiarum Hungaricae,* v. 16, 1957, p. 121-129.

The production of high-purity aluminum; the crystallization of cast light metal ingots, more particularly the behavior of impurities. Development of the aluminum-copper, aluminum-copper-magnesium, aluminum-copper-magnesium-manganese, aluminum-magnesium-zinc and

finally of the so-called superalloys and their use in jet aircraft.
(A general, N12, T24; Al)

213-A. (German.) **Titanium—the Metallic Industrial Material of the Future.** W. Hess. *Technica,* v. 6, Mar. 1, 1957, p. 197-202. (CMA)

A general survey of the preparation, physical, mechanical and chemical properties, processing and the applications of titanium. A flow sheet illustrates the various titanium production methods, and the major properties of the metal are shown in tables and graphs. 10 ref.
(A general; Ti)

214-A. (Spanish.) **The Teaching of Welding in France, Belgium and England. Conclusions and Proposal of Plan for Training Journeymen and Master Welders.** *Ciencia y Técnica de la Soldadura,* v. 7, Jan-Feb. 1957, 18 p.

Survey of instruction available and sponsorship in the three countries; proposes plan for overcoming shortage of skilled welders in Spain and maintaining adequate supply in future. (A3, K general)

215-A. Ship-Plate and Constructional Steels. A. M. Sage. *Iron and Coal Trades Review,* v. 174, Apr. 12, 1957, p. 849-852.

Demand for ship-plate and constructional steel is already exceeding the supply and is certain to increase; important factors include use of bessemer steel, changes in casting and rolling practice and prevention of brittle-type fractures in welded structures.
(A4p, T22g; ST, SGB-s)

216-A. Production Engineering Research. *Mechanical World and Engineering Record,* v. 137, Apr. 1957, p. 176-178.

Research being carried on by the Production Engineering Research Association on machining, stamping, machine tools, impact extrusion, tool grinding, deburring, cutting fluids, automation, deep drawing, reaming and surface finishing.
(A9m, G general)

217-A. Production of Ilmenite in Western Australia. J. A. Dunn and J. W. Morgan. *Mining Journal,* v. 248, no. 6345, Mar. 29, 1957, p. 400-401. (CMA)

Ilmenite recovery operations in Western Australia by Western Titanium N. I. and Cable Ltd.; Westralian Oil Ltd. is planning to enter the industry. The ilmenite of Western Australia has a low chromium content and is suitable for pigment manufacture. Freight and production costs are considered. Projected West Australian production would represent less than 20% of the world's total. (A11a; Ti)

218-A. The World's Uranium. C. F. Davidson. *New Scientist,* Feb. 21, 1957, p. 9-11.

Known deposits in non-Communist countries are at least a million tons. Many sources are being exploited in the occupied countries, and, with 25,000 geologists available, it seems certain that big deposits will be found in Russia itself. (A11a; U)

219-A. Demand for Aluminum Expected to Double Within Decade; 1957 Shipments Likely to Rise 5 to 10%. R. L. Sheneman. *Waste Trade Journal,* Apr. 13, 1957, p. 26-28.

Existing and planned capacity in free world outside U.S. indicates an expansion by 1960 sufficient to raise annual use 50% above 1955 level.
(A4p; Al)

220-A. (English.) **Association of French Steel Casting Manufacturers.** *Aciers Fins & Speciaux,* no. 25, Mar. 1957, p. 6-8.

Description of the various groups included in this organization (A.S.F.R.A.M.). The association is nonprofit and endeavors to establish early technical liaison between founder and user, foster research and advise its member firms.
(A12g; ST, 5)

221-A. (English.) **Alloy Steel Castings.** *Aciers Fins & Speciaux,* no. 25, Mar. 1957, p. 27-34.

Types of special steels most frequently encountered in French production of parts cast in special steel; includes consideration of 12% manganese steels, engineering alloy steels, stainless steels and heat resisting steels; composition, heat treatment and properties of each type are specified, together with applications. (A general; AY, 5)

222-A. (French.) **Mechanical Ventilation of Laboratories.** *Journal d'Informations Techniques des Industries de la Fonderie,* no. 84, Feb. 1957, p. 17-20.

Necessity in laboratories devoted to the analysis of metals of providing adequate ventilation for the dispersal of acid vapors; ventilation methods currently in use. (A8a, W10)

223-A. (French.) **The Liege-Charleroi Basin and Its Contribution to Europe.** *Metallurgie et la Construction Mecanique,* v. 89, Mar. 1957, p. 219-231.

Diversity and importance of Belgian industry; coal, coke, iron and steel production; raw materials, production and sales; wiredrawing and foundries; Association of Belgian Blast Furnaces and Steel Works; list of producers with their types of products.
(A4n, D general, F general; ST)

224-A. (German.) **Production Expansion as Determining Factors for Basic Research in the Field of the Chemical Technology of Light Metals.** H. Ginsberg. *Metall,* v. 11, Mar. 1957, p. 176-179.

Estimate of production expansion. Process developments in the aluminum field caused by production expansion. Process developments in other light metals (magnesium, titanium, beryllium). 14 ref.
(A4p, A9k; EG-a39)

225-A. (Italian.) **Brass and Zinc Among the Ancients.** Giovanni Rolandi and Giovanni Scacciati. *Industria Mineraria,* v. 7, Nov. 1956, p. 759-770.

Processes and equipment, chemical and physical analyses, uses of these metals as deduced from early Greek and Roman literature, surviving objects and fragments, other historical sources. (A2; Cu-n, Zn)

226-A. (Portuguese.) **Description of a Brazilian Alloy Steel Mill.** Luiz Dumont Villares. *Engenharia, Mineracao e Metalurgia,* v. 24, Nov. 1956, p. 297-301.

Acos Villares, S. A. (Villares Steel Co.) plant in Sao Caetano do Sul, state of Sao Paulo. Production program, future expansion plans, raw materials, equipment; technical and personnel problems. (A4p, A5; AY)

227-A. (Portuguese.) **Problem of Brazilian Iron Ores as Seen by a Geologist.** John Van N. Dorr, II. *Engenharia, Mineracao e Metalurgia,* v. 24, Dec. 1956, p. 365-373.

Nature and origin of potential reserves of iron ores in state of Minas Gerais; marketing aspects, both technical and economic.
(A11a, A4q; Fe, RM-n)

228-A. (Portuguese.) **A Metallurgical Institute.** Waldemar de Lima e Silva. *Engenharia, Mineracao e Metalurgia,* v. 25, Dec. 1956, p. 379-382.

Outlines need for information and research center in Brazil; proposes joint government and industry support; suggests lines of research, publication of a metals journal, organization and curriculum of courses in metallurgical engineering and metallurgical science. (A9, A3)

229-A. (Portuguese.) **Figures Are Proof. Production Increasing at Volta Redonda.** *Engenharia, Mineracao e Metalurgia,* v. 24, Dec. 1956, p. 391-392.

Production figures for coke, pig iron, steel ingots, strip, hot and cold rolled strip, etc., for January-September, 1955 and 1956. Current uses in metal building construction.
(A4p, T26n; Fe, ST)

230-A. (Swedish.) **Utilization of Low-Grade Ores: Problems Concerning the Future Supply of Minerals.** P. G. Kihlstedt. *Jernkontorets Annaler,* v. 141, no. 1, 1957, p. 1-27.

Survey of raw material situation from the point of view of policy, technical developments, consumption and price trends. Importance of international cooperation and of better education of mining engineers and metallurgists. 18 ref.
(A4p, A3; RM-n)

231-A. (Pamphlet.) **Applications and Properties of Zirconium and Alloys.** 7 p. 1957. Columbia-National Corp., 70 Memorial Dr., Cambridge 42, Mass.

Sources of information pertaining to the applications and the mechanical, physical, electrical, chemical and nuclear properties of zirconium and its alloys have been collected and tabulated for those who may be considering the use of zirconium.
(A general; Zr)

232-A. (Book.) **Properties of Aluminium and Its Alloys.** Bulletin #2, Revised Ed. 204 p. 1955. The Aluminium Development Association, 33 Grosvenor St., London W1, England. 7s.6d.

Information and data including brief classification of main groups of aluminum materials and physical properties. Note on nomenclature of British standards and aircraft specifications and tabulated data of aluminum materials, including compositions and mechanical properties indicating proprietary names of many compositions; brief note on mechanical test requirements and test methods and characteristics of aluminum in certain fields such as super-purity alloys, foil, electrical conductors, sintered alloys; outline of characteristics affecting design; guide to alloy selection.
(A general, Q general, Al)

233-A. (Book.) **Process and Physical Metallurgy.** Revised Ed. James E. Garside. 593 p. 1956. Charles Griffin & Co. Ltd., 42 Drury Lane, London W.C. 2, England. 54s.

Written from the standpoint of the user of metallic materials, particularly from the engineer's angle. Covers fuels, refractories, furnaces, molding materials, pyrometry, mechanical deformation, heat treatment, and the joining of metals, arranged in relationship to the theoretical aspects of metallurgical science. Two new chapters have been incorporated—on powder metallurgy and on corrosion. (A general)

234-A. (Book.) **Materials of Construction.** Adelbert P. Mills, Harrison W. Hayward and Lloyd F. Rader. 6th Ed. 650 p. 1955. John Wiley & Sons, 440 Fourth Ave., New York 16, N. Y. $7.50.

Text for engineering students; includes sections on structure, constitution, tests, service requirements and sources of metals; outlines properties of pig iron, steel, wrought iron, cast iron, malleable cast iron, alloy steels and nonferrous metals. (A general; SGB-s)

235-A. (Book—German.) **Gmelin's Handbook of Inorganic Chemistry.** System No. 28. Calcium, Part A, Section 2. 8th ed. 420 p. 1957. Verlag Chemie, GmbH, Weinheim-Bergstrasse, West Germany. $55.68.

Deals with the occurrence of calcium, elemental calcium and calcium alloys. Covers the industrially important deposits of fluorspar calcium phosphate and the known deposits of Iceland-spar as well as briefly reviewing economically significant gypsum and anhydrite deposits. (A general; Ca)

236-A. (Book—German.) **Gmelin's Handbook of Inorganic Chemistry.** System No. 68. Platinum, Part D. 8th ed. 638 p. 1957. Verlag Chemie, GmbH, Weinheim-Bergstrasse, West Germany. $90.

Treats 2880 platinum compounds. A formula index arranged by type and number of neutral ligands; simplifies locating of individual compounds. Numerous cross references to related compounds treated in different chapters which facilitates general orientation. (A general; Pt)

237-A. (Book—German.) **Gmelin's Handbook of Inorganic Chemistry.** System No. 32. Zinc. 8th ed. 1025 p. 1956. Verlag Chemie, GmbH, Weinheim-Bergstrasse, West Germany. $138.

Treats the element zinc, its compounds and alloys. An entirely new chapter on the geochemistry of zinc has been added to the material on occurrence. The metallurgy of zinc is fully presented including the processes which precede the recovery of the metal itself. (A general; Zn)

238-A. **Development and Growth of the Australian Steel Industry.** *Engineer,* v. 203, Mar. 29, 1957, p. 501-502.

History of the Australian steel industry and present sources of raw materials. (A11a, A2; ST)

239-A. (Finnish.) **Production Prospects of Otanmaki Titanium Ore.** O. Runolinna. *Teknillisen Kemian Aikakauslehti,* v. 14, Mar. 15, 1957, p. 107-110. (CMA)

The ore mined by Otanmaki Co. (Finland) contains 28% ilmenite ($FeTiO_3$), 35% magnetite (Fe_3O_4) and 1% pyrite (FeS_2), the remainder being silicates. The production, which began in 1953, reached an output of 743,000 tons in 1956. It is composed of iron concentrates and sinter, vanadium pentoxide, iron pyrite, ilmenite concentrate and crushed stone. (A4p, A11a; Ti, 14-9)

240-A. (French.) **Some New Applications of Rare-Earth Metals.** Felix Trombe. *Chimie et Industrie,* v. 77, Mar. 1957, p. 540-546. (CMA)

Rare earths promise significant applications in metallurgy, mainly as alloy components and as refining agents. It is the intense chemical affinity of rare earth elements to both metals and nonmetals, combined with the high refractoriness of the compounds so formed, that is the principal source of their valuable metallurgical properties. The study of the alloys has not yet lasted long enough (especially that involving the yttrium group of the rare earths) to permit of definite conclusions of practical applications; the high price of these substances is a handicap. One may mention the high melting point of $PrGa_2$ (1470° C.), of the system praseodymium-gallium with components melting very much lower (gallium melts at 29.5° C.). Considerably more important is the role the rare earths may play as refining agents. A few thousandths by weight added to cast iron causes the precipitation of the spheroidal graphite which characterizes the mechanically superior variety of

cast iron. One or two thousandths added to stainless steel insures its perfect forgeability. The life of wires for electric heating (made of Ni-Cr or other alloys) is considerably prolonged when small amounts of rare earth metals are added to the material. The separation of rare earths being too expensive, mixtures of them are used in the operations mentioned above; Lanceramp is composed of lanthanum, cerium, neodymium, praseodymium and samarium and is obtained from electrolytic slimes; misch metal contains mainly lanthanum, cerium and neodymium and is produced directly from monazite.
(A general, 17-7; EG-g, AD-n)

241-A. (French.) **Some Generalities on Titanium and Its Metallurgy.** Marcel Fourment. *Société des Ingenieurs Civils de France, Memoires,* v. 110, Jan-Feb. 1957, p. 11-21. (CMA)

A lengthy review of titanium metallurgy surveys its historical development, the current economic situation as regards titanium production, the properties of metal and its alloys (alpha, beta, and alpha-beta), the production of titanium by the reduction of its tetrachloride (Kroll process) and by elecrolytic reduction, various melting methods, and refining of the metal.
(A general; Ti)

242-A. (German.) **Titanium, Its Manufacture and Properties.** W. Hess. *Chemische Rundschau,* v. 10, Apr. 1, 1957, p. 141-144. (CMA)

Production statistics, metallurgy and properties of titanium described. Several tables and diagrams illustrate the characteristics of various commercial kinds of titanium produced in Germany by F. Krupp in Essen, and Vereinigte Deutsche Metallwerke in Frankfurt. 37 ref.
(A general; Ti)

243-A. (Portuguese.) **Some Occurrences of Allanitic Ores in Rio Grande do Norte.** R. Agrentiere. *Engenharia, Mineracao e Metallurgia,* v. 25, Mar. 1957, p. 129-132. (CMA)

The author visited several localities in the State of Rio Grande do Norte, in northeastern Brazil (townships of Santa Cruz, Ezequiel and Fernando Pedrosa), which had been reported as bearing minerals of the group of allanite (synonyms: orthite, ceric epidote; constitution: (Ca, Ce, $Th)_2(Al, Fe, Mg)_3Si_3O_2(OH)$). Rock bodies containing these minerals are associated with altered pegmatites of the region. Field examination of the radioactivity of the ores pointed to the existence of uranium as well as thorium. The survey was of a preliminary character. 9 ref.
(A11a; U, Th, 14-9)

244-A. Ion Exchange in a Modern Nickel-Chromium Plating Plant. *Electroplating and Metal Finishing,* v. 10, Apr. 1957, p. 116-118.

Operation of ion exchange columns for the recovery of water and copper, nickel and chromium from rinse water of plating plant.
(A8b, L17; Cu, Ni, Cr)

245-A. Hazards of Beryllium and Its Compounds. Katherine Williams. *Industrial Chemistry,* v. 33, Apr. 1957, p. 191-193.

Discovery of toxic effects due to beryllium, refers to the characteristics of beryllium poisoning, acute and chronic, and describes preventive control measures. (A7n; Be)

246-A. Dust Problems of the Iron and Steel Industry—Measures to Stop Atmospheric Pollution. M. W. Thring and R. J. Sarjant. *Iron and Coal Trades Review,* v. 174, Mar. 29, 1957, p. 731-735.

Problems of dust control in arc furnaces, blast furnaces, coke ovens, reheating furnaces and heat treatment furnaces. (A8a, D general; ST)

247-A. Heat, Fuel and Power Balances in an Integrated Steelworks. J. Roberts and J. C. A. Cowan. *Iron and Coal Trades Review,* v. 174, Apr. 5, 1957, p. 781-791.

Integrated iron and steel plants can be made almost independent of outside sources of energy and may be able to sell surplus energy to outside consumers; how over-all energy balance of a new plant was pre-planned. (A5, 16; ST)

248-A. Concentration of Blast Furnace Flue Dust. S. B. Das Gupta and P. I. A. Narayanan. *Journal of Scientific and Industrial Research,* v. 16A, Jan. 1957, p. 42-44.

Tabling of the dust after classification provided a satisfactory recovery. The concentrate could probably be fed back into the furnace after sintering. (A8a, D1)

249-A. Copperbelt of Northern Rhodesia. Ronald Prain. *Metal Industry,* v. 90, Mar. 29, 1957, p. 245-247.

Development of copper mining industry in Northern Rhodesia and its present and future positions. (A11a; Cu)

250-A. Prevention of Accidents in Iron and Steel Works. *Metallurgia,* v. 55, Apr. 1957, p. 171-172.

Notes recommendations of committee of British Iron and Steel Federation on safe coupling of ingot casting cars; operation of straightening machines and prevention of gassing accidents. (A7p, W19e, 1-2; Fe, ST)

251-A. Tungsten Utilization for High Purity Applications. Russell C. Nelson. *Mines Magazine,* v. 57, Mar. 1957, p. 68-73.

Refining, alloying, fabrication and use of tungsten by the electronic, electrical and carbide industries. (A general, C general, Ti, 17-7; W-a)

252-A. Manganese Situation. Fritz A. McGonigle. *Mines Magazine,* v. 47, Mar. 1957, p. 112-115.

Future of the manganese industry; manganese deposits in U.S.A. and foreign countries. (A4n; Mn, 14-9)

253-A. Titanium—Today and Tomorrow. Kim Darby. *Modern Metals,* v. 13, May 1957, p. 84. (CMA)

The growth of the titanium industry in a period of ten years is noted. The industry has a $1 billion potential by 1965 and may eventually reach the current levels of the aluminum and stainless steel industries. Government has a lesser role in the industry than a few years ago. The operations of five sponge producers are described; three other firms will enter the field soon. The trend is toward sodium reduction of titanium but great efforts are being expended to find a cheap electrolytic method. Sponge melting firms, $TiCl_4$ producers, and firms extruding titanium are discussed. (A4, C general; Ti)

254-A. Uranium Requirements of the Western World. *South American Mining Engineering Journal,* v. 68, Mar. 8, 1957, p. 423-427.

Development of peacetime uses of thermonuclear reactors indicates that the demand for uranium oxide will expand greatly during the coming years, and that it may be of the order of 100,000 tons a year. (A4p; U)

255-A. Molybdenum. A Materials Survey. W. McInnis. *U.S. Bureau of Mines, Information Circular* 7784, Apr. 1957, 77 p. (CMA)

Following a brief historical survey of molybdenum development and production, the geology and resources of numerous molybdenum deposits in the Western United States and in North Carolina are described. Supply of and demand for molybdenum are considered. Mining methods of the Questa (N.M.) and Climax mines and the beneficiation and conversion practices of several firms are discussed. Production, world trade, controls, forms, properties and uses of molybdenum are treated thoroughly. (A4, B general; Mo)

256-A. New Heating Element Material. *Metallurgia,* v. 55, May 1957, p. 239-240. (CMA)

Aktiebolaget Kanthal (Sweden) has developed a cermet based on $MoSi_2$ and SiO_2 which is hard and brittle and has high bending and tensile strength and low impact strength. Its density increases in the first few hours of operation as a heating element since the sintering process continues. Designated Kanthal-Super, the cermet is intended for use at about 1600° C. Element life depends on furnace conditions, such as surface loading and frequency of temperature change. (A general; SGA-q; 6-20)

257-A. (French.) **Future of the Iron and Steel Industry and Industrial Decentralization.** Andre Guedras. *Metallurgie et la Construction Mecanique,* v. 89, Apr. 1957, p. 303-305.

The discovery of natural gas in the southwest of France and the expansion of the metallurgical industry, which is seeking new sources of ore, will perhaps lead to the erection of new works either at Bayonne or Bordeaux. Factors involved in the selection of an ore-reducing process. (A4n; RM-m, Fe, ST)

258-A. (French.) **Symposium on Special Steels at 5th Chemistry Exhibition.** *Metallurgie et la Construction Mecanique,* v. 89, Apr. 1957, p. 315-326.

Contains the following lectures: M. Dingeon, Chromium and Ferrochromium in Special Steels; Walter Peter, Steels With High Chromium Content; M. Herzog, Aluminum-Chromium Steels. Composition, properties and applications are covered. (A general; ST, *Cr, Al*)

259-A. (German.) **Contribution to the Technology of Tin Recovery From**

Scrap Metals. H. Anders. *Metall,* v. 11, Apr. 1957, p. 305-306.

Contamination of white metal scrap by iron, zinc and sulphur. Addition of fluxes; smelting in blast furnace. Recovery of the oxides of tin, zinc and lead by Cottrell precipitation. 2 ref.
(A11d; Sn, Zn, Pb, RM-p)

260-A. (Portuguese.) **Manganese in the State of Amapa.** Joao Gustavo Haenl. *ABM-Noticiario,* v. 11, Mar. 1957, p. 2-5.

Ores discovered in Navio mountain range in 1941 contain 46 to 48% MnO_2, have assured market, and, coupled with deposits elsewhere, can make Brazil largest manganese producer in the world. In area explored to date in Amapa are an estimated 30 million tons of commercially usable ore. Industrial development of area to date; future plans.
(A11a; Mn, 14-9)

261-A. Uranium Industry in France. Maurice Moyal. *Canadian Mining Journal,* v. 78, Mar. 1957, p. 76-79.

Mining districts and the reduction of the pure oxide and extraction of uranium metal in France.
(A4n, B general, C general; U)

262-A. Cerium. J. Lomas. *Canadian Mining Journal,* v. 78, May 1957, p. 115-116. (CMA)

Cerium, the most important of the lanthanons, may be produced by reducing the trichloride with sodium or by electrolysis of the trichloride in methanol or ethanol and collecting the metal at the cathode as an amalgam. Difficulties in getting the pure metal are mainly technical. The properties of cerium are described. Cerium is amenable to powder metallurgical techniques. Uses include gettering for vacuum tubes, cigarette lighter material, alloying ingredient for aluminum, magnesium and stainless steel, additive for ceramics, arc-stabilizer in carbon arc lamps, and medicine (as the oxalate).
(A general; Ce)

263-A. Niobium's Future Unlimited. *Chemical and Engineering News,* v. 35, May 27, 1957, p. 25-26.

Present and future use of columbium and columbium alloys.
(A general; Cb, 17-7)

264-A. Metallurgy and the Science of Materials. Maxwell Gensamer. *Columbia Engineering Quarterly,* Mar. 1957, p. 20-21, 58.

Metallurgy, past and future; significance and application of physical metallurgy. (A general)

265-A. Britons Give Us a New Aluminum Bronze. *Design Engineering,* v. 3, Apr. 1957, p. 66-67.

A new high-strength, copper-base alloy having better castability and more attractive mechanical properties than conventional bronzes (Superston 40).
(A general, E25p; Cn, *Al*)

266-A. Spheroidal Graphite Iron. R. Janardhanam. *Institution of Engineers (India) Journal,* v. 37, Jan. 1957, p. 459-494.

Mechanical properties, service properties and production characteristics of spheroidal graphite iron. Production problems and economics, with particular reference to Indian irons. 10 ref. (A general; CI-r)

267-A. Safety in Metal Finishing. Leonard E. Weeg. *Plating,* v. 44, May 1957, p. 510-512.

Safety practices in a plating plant.
(A7p, L17)

268-A. Expanding Need in Nuclear Age for Variety of Metals With Special Properties, Applications. David D. Moore. *Waste Trade Journal,* v. 103, Mar. 30, 1957, p. 49, 109, 113.

New uses for titanium, zirconium, beryllium, magnesium, nickel, cobalt and molybdenum increase importance of scrap. (A8d, B23; RM-p)

269-A. (Czech.) **For Better Production Planning in Metallurgical Works.** Vladimir Smid. *Hutnické Listy,* v. 12, Mar. 1957, p. 243-248.

The functions of the production department in a metallurgical works; principles of planning and scheduling. (A5b)

270-A. (French.) **Extraction of Plutonium and Uranium From Nuclear Fuel.** N. Isaac. *Industrie Chimique Belge,* v. 22, no. 2, 1957, p. 139-152.

Two types of extraction processes reviewed: (a) those requiring placement of the solid fuel in solution and therefore taking place in aqueous media; (b) those characterized by use of high temperatures and therefore taking place in absence of water. Advantages and disadvantages of the better known processes; purification systems given in charts. Particular attention drawn to methods of extraction by means of solvents and fractional distillation of fluorinated derivatives. 15 ref.
(A11d, C19, T11g, 17-7; U, Pu)

271-A. (French.) **Evolution of Low-Alloy Heat Treated Steels in France and Abroad.** Georges Delbart and André Michel. *Société des Ingénieurs Civils de France, Mémoires,* v. 110, Jan-Feb. 1957, p. 22-49.

Rationing of nickel and molybdenum in France during World War II gave rise to search there for substitute low-alloy construction steels. Chemical composition and use of such substitute structural steels as developed in France, Great Britain, Germany and Russia since 1941; welding steels; high strength steels in the U.S.; influence of alloys on mechanical properties of steel. (A11b; AY)

272-A. (German.) **Removing the Dust From the Converter Waste-Gases.** Willi Dehne. *Stahl und Eisen,* v. 77, May 2, 1957, p. 553-562.

Dry primary purification; washing-out tests in the chimney; small-scale tests with filters and rotating brushes; coagulation of the dust particles by the sound waves of whistles and sirens; ring-gap scrubbers and electric filters; formation of oxide dust at the converter throat; prevention of the oxide-dust formation by injecting steam through the bottom; dry-cooling by waste-heat boilers. (A8a, D3)

273-A. (Italian.) **Mercury From the Almadén Mines.** Francisco Alvarez Ros. *Industria Mineraria,* v. 8, Feb. 1957, p. 77-84.

Richness of deposits at Almadén (Central Spain) and use of modern equipment imported from America permits extraction of 95% and higher of metal contained in ores found there. Hydrargyrism (chronic mercurial poisoning) is not a problem at Almadén now. History of workings since primitive times; strategic and economic importance of these deposits in modern world. (A4n, A7n; B general; Hg)

274-A. (Japanese.) **Survey of the Aluminum Industry.** Jiro Kitagawa. *Electrochemical Society of Japan, Journal,* v. 25, Jan. 1957, p. 2-7.

Development of aluminum industry, from statistical point of view. 23 ref. (A4; Al)

275-A. (Portuguese.) **Mineral Resources of the Republic of the Sudan.** Hamfrit Putzer. *Engenharia, Mineracao e Metalurgia,* v. 25, Feb. 1957, p. 83-84.

Manganese mines have high-quality ore, but deposits are small; two small iron ore deposits (estimated reserve of 3 million tons of 55-60% Fe) known; large unmined gypsum beds; other poor or unworkable deposits of various kinds described briefly. Concludes that groundwater seems to be most potentially valuable mineral in this arid and semi-arid country. (A4n; Mn, 14-9)

276-A. (Portuguese.) **Tantalite and Columbite.** Robert Soliva. *Engenharia, Mineracao e Metalurgia,* v. 25, Feb. 1957, p. 86-88.

Applications and uses of tantalum and columbium, world production and consumption, market data, Brazilian deposits. (A4p; Ta, Cb, 17-7)

277-A. (Book.) **Story of Cold Finished Steel Bars.** Fred J. Robbins. 67 p. May 1957. American Steel Warehouse Association, Terminal Tower, Cleveland, Ohio. $1.

Handbook on cold finished steel bars intended mainly for the steel warehousing industry. (A general, F27; ST, 4-5)

278-A. (Book.) **Semiconductor Abstracts, v. 3, 1955.** Battelle Memorial Institute, Compiler. 322 p. 1957, John Wiley & Sons, Inc., 440 Fourth Ave., New York 16, N. Y. $10.

Third annual volume containing many more abstracts than previous volume (1258), and covering several fringe areas. In addition to the sections on materials, there is one on theory. Author and subject indexes. (A general; SGA-r)

279-A. (Book.) **Metal Industry Handbook and Directory 1957.** 536 p. 1957. Iliffe & Sons Ltd., Dorset House, Stamford St., London, England. 15s.

General properties of metals and alloys, electroplating and allied processes, trade names, metal trade associations and directory of buyers. (A general, L general)

280-A. (Book—German.) **Handbook for the Metal Trades.** Wilhelm Friedrich. Ed. A. 224 p. 1957. Ferd. Dümmler Verlag, Kaiserstrasse 33/37, Bonn, Germany. DM 5.80.

Contents in tabular form: basic mathematical and physical computations; raw materials and metallurgy; semifinished products; machining and tooling; motors and pyrometry; symbols and drafting aids. (A general, 18)

281-A. Methods for Reclaiming and Processing Scrap From Steel

Plant Slags and Refuse. Lawrence J. Fritz. *Iron and Steel Engineer,* v. 34, Apr. 1957, p. 95-97.

Description of wasted slag and refuse and inefficient slag yard scrap recovery operations. Recovery operations can be profitable; in a typical plant with a production of 2,500,000 ingot tons, some 50,000 tons can be recovered.
(A11d; ST, RM-p, RM-q)

282-A. Hawaii Bauxite; Outlook for a New Alumina Industry in the West. Pt. 1. Roy Fellom, Jr. *Light Metal Age,* v. 15, Apr. 1957, p. 12-19.

Location, nature, extent, origin and possibilities of economic development of Hawaii bauxite deposits. (A4n; Al)

283-A. New Horizons for Lithium. P. E. Landolt. *Mining Engineering,* v. 9, Apr. 1957, p. 460-464.

Brief report on explored reserves, mining methods, concentration methods, extraction processes, present and probable future consumption of lithium.
(A11a, B general, C general; Li)

284-A. (Italian.) **On the Manufacturing Technique of Etruscan Mirrors.** C. Panseri and M. Leoni. *Metallurgia Italiana,* v. 49, Apr. 1957, p. 233-241.

Description of the manufacture of Etruscan bronze mirrors, ascertained on the basis of accurate metallographic studies made on ten mirrors found in the Etruscan excavations. (A2; Cu-s)

285-A. Polonium—the Neglected Element. W. C. Fernelius. *Atomics and Nuclear Energy,* v. 8, May 1957, p. 173-174.

Separation, properties and compounds of polonium. (A general; Po)

286-A. Research and the Future of Iron and Steel Making. Charles Goodeve. *Australasian Engineer,* no. 46, Mar. 7, 1957, p. 59-60.

Brief remarks on modern steelmaking, and in particular on Australian steel research.
(A9, D general; ST)

287-A. A Metallurgist's View of Metallurgy. Earle E. Schumacher. *Bell Laboratories Record,* v. 35, May 1957, p. 161-167.

From the precise measurement of elusive physical and electrical properties to the formulation of specific alloys tailored to meet rigid design specifications, the metallurgist's skills must embrace a variety of techniques and fundamental processes. (A general)

288-A. Role of Electrolytic Manganese in the Metal Industries. E. H. Bucknal. *India Section of the Electrochemical Society, Bulletin,* v. 5, July 1956, p. 56-57.

Use of ferromanganese in the production of low-alloy steels, stainless steel, toolsteel, screw steel, silicon electrical steel and in steel castings; in the manufacture of manganese steel and welding steel; as a substitute for nickel in stainless steel and nonferrous alloys; as a substitute for copper and zinc in brass. 5 ref.
(A general; Fe, Mn, AD-n)

289-A. Effective Control of Welding Fumes. Stan E. Nelson. *Institution of Heating and Ventilating Engineers, Journal,* v. 25, Apr. 1957, p. 18-25.

Trials to determine specific requirements of air volumes and velocities, hood sizes and shapes, to produce minimum air-flow velocity at the weld, to insure control of fumes and to permit reasonable freedom from interference with general welding operations.
(A8a, K general)

290-A. Clean Air Conference. J. M. Beskine. *Iron and Steel,* v. 30, Apr. 1957, p. 143-146.

Summary of papers and discussion on air pollution problems, with brief descriptions of manual and electrostatic cleaners in elimination of dust and smoke problems in cupola, openhearth, arc, bessemer, blast and heat treatment furnaces; measurement of dust. (A8a, 1-2)

291-A. Cyanide Plating Waste Disposal. D. R. Johnson. *Metal Finishing,* v. 55, June 1957, p. 85-87.

Six methods investigated and results indicated that heating the waste solution with sodium hydroxide and aeration is a rapid, cheap and reasonably safe disposal method. 3 ref. (A8b; L17)

292-A. Science for Electroplaters. Pt. 25. Waste Disposal. L. Serota. *Metal Finishing,* v. 55, June 1957, p. 88-90.

Treatment methods commonly employed or considered include recovery or reclaim for re-use of plating wastes; modification of processes; lagoons; chemical treatment.
(A8b, L17)

293-A. Uranium Deposits of Northeastern Washington. H. W. Norman.

Mining Engineering, v. 9, June 1957, p. 662-666.

History and prospects of future development stimulated by a local market. (A4n; U)

294-A. Prospects for Rutile. J. A. Dunn and J. W. Morgan. *Mining Journal,* v. 248, May 10, 1957, p. 586-587. (CMA)

The demand for rutile and the expansion of the rutile industry are discussed in the light of short-term factors such as uncertainty between rutile and ilmenite as a raw material, and recent expansion beyond demands for normal consumption. The ease of working beach sand deposits is a temptation to the rapid opening of new leases and can quickly lead to overproduction. A return to the high rutile prices of last year is not expected. (A4n; Ti, RM-n)

295-A. Safety Geared to New Shop Tempo. R. G. Phelps. *Steel,* v. 140, May 6, 1957, p. 92-95.

Safety equipment and practices in new openhearth shop at Inland Steel Co. (A7p, D2)

296-A. (German.) **Properties and Application of Titanium Nitride and Titanium Carbide.** A. Münster. *Angewandte Chemie,* v. 69, May 7, 1957, p. 281-290. (CMA)

Recent literature on the preparation, properties and applications of titanium nitride and titanium carbide is surveyed. The author's contribution to the manufacturing of titanium carbide coatings on steel and cast iron is briefly outlined. It is a modified van Arkel vapor plating procedure (deposition of TiC from a gas mixture of $TiCl_4$, hydrocarbon and hydrogen). The modification consists of (1) the use of lower temperatures (about 950° C.) which do not affect the mechanical properties of the metal being coated, (2) a close adjustment of the equilibrium proportion of the amounts of hydrogen and hydrocarbon, to avoid precipitation of free carbon, and (3) the selection of an appropriate catalyst. The properties of TiN and TiC are examined in the light of recent studies on the nature of chemical bonds in the crystalline structure of these substances and on the crystal energy levels. 64 ref. (A general; Ti, 14-18)

297-A. (German.) **Production of High Speed Steel in the German Democratic Republic.** Karlheinz Werner. *Neue Hütte,* v. 2, Apr. 1957, p. 214-219.

Melting process, charge, furnace practice and casting conditions; description of the soft annealing process; the most favorable temperature of deformation; influence of the degree of deformation on the structural constitution; appropriate utilization of the steel. 25 ref. (A general; TS-m)

298-A. (Russian.) **Industrial Types of Titanium Deposits in Capitalist Countries.** V. N. Kotlyar and B. V. Kristal'nyi *Gornyi Zhurnal,* Apr. 1957, p. 69-73. (CMA)

Industrially exploited deposits of ilmenite and rutile are of three different origins: magmatic, metamorphic and sedimentary. Magmatic deposits are: (1) lenses or dykes of iron-titanium ores in anorthosites (Adirondacks, Wyoming, Colorado, Virginia, Quebec, Norway); (2) lenses of iron-titanium ores in gabbros (California, Egypt); (3) veins with rutile and ilmenite in nepheline-syenites (Arkansas, Norway). Metamorphic deposits are: (1) rutile ores in granogneisses (recently discovered important deposit of Fuerto Angel in Mexico); (2) quartzites enriched in brookite, and orthorhombic TiO_2 (Arkansas). Sedimentary deposits are: (1) pre-quaternary sands and clays enriched in titanium minerals (Wyoming, Japan); (2) quaternary and recent shore sands containing ilmenite, rutile, zircon and monazite (Florida, Brazil, Union of South Africa, French West Africa, Egypt, Ceylon, India, Australia). In 1954, 60% of ilmenite came from sources of magmatic origin, and 40% from recent sands; the present tendency is to shift the leading part to recent sands. In 1954, 1% of rutile came from magmatic deposits, 99% from recent sands; with the forthcoming exploitation of Puerto Angel metamorphies, the distribution is expected to be: magmatic sources 2%, metamorphic 15%, recent 83%. 29 ref. (A11a; Ti)

299-A. Review of Iron and Steel Literature for 1956. Pt. 2. V. S. Polansky. *Blast Furnace and Steel Plant,* v. 45, May 1957, p. 501-504, 513.

Lists books and pamphlets (foreign and U.S.) together with U.S. Government publications of interest to iron and steel industry. (A general; Fe, ST)

300-A. Magnetic Cleaning of Roll Coolant. A. L. Wilson, Jr. *British Steelmaker,* v. 23, May 1957, p. 146-148.

Magnetic drum-type separators can achieve over 85% reduction of contaminant load in rolling mill coolant; both magnetically responsive material and tramp oil handled by separators. (A8b, W13h; NM-h)

301-A. Report of the Castings Research Laboratory. No. 7. Waseda University, Tokyo, Japan. *Castings,* v. 3, Mar. 1957, p. 34-35.

Lists titles of 17 articles on cast iron and other cast metals published in English by Waseda University. (A general; CI, 5)

302-A. Refining and Using Nickel. L. B. Pfeil. *Engineer,* v. 203, May 10, 1957, p. 720-721.

Old and new methods of refining, some of the uses of nickel, and the development of the nimonic series of alloys.
(A general, C general; Ni, 17-7)

303-A. Will Lower Prices Help Titanium? K. W. Bennett. *Iron Age,* v. 179, June 13, 1957, p. 88-89. (CMA)

Cutbacks in defense spending are the first serious threat to the growth of the titanium industry. U.S. Air Force procurement has slowed and rolling mill schedules have been cut back. Producers plan to counter the threat by price cuts, and further cuts may be possible if Armour's titanium tetrachloride process is adopted. Titanium continues to expand but operations may be scheduled at 60% by July. Temporarily stalled expansions may be permanently delayed. The shock may halt the acceptance of wider applications in many fields. (A4q; Ti)

304-A. Blast Furnace U.S.A. Pt. 1. Colonial Ironmakers. M. O. Holowaty and C. M. Squarcy. *Journal of Metals,* v. 9, May 1957, p. 657-661.

Early iron production in Maryland and Virginia with details of mining methods and operations at Spotswood Principio and Accokeek furnaces. (To be continued.)
(A2, D1)

305-A. Some Aspects of Government-Sponsored Research in Metallurgy. Julius J. Harwood. *Journal of Metals,* v. 9, May 1957, p. 665-670.

Presents significant scientific and administrative aspects of U.S. Government contract basic research program in metallurgy and ceramics.
(A9k)

306-A. Symposium on Government-Sponsored Research Metallurgy Research Program of the Air Force Office of Scientific Research, of the National Science Foundation, of the Office of Naval Research, of the Atomic Energy Commission, of the Aeronautical Research Laboratory. *Journal of Metals,* v. 9, May 1957, p. 671-676.

Brief notes on important policies and range and objectives of research of government supported agencies.
(A9h)

307-A. Safety Precautions in the Fabrication and Use of Titanium. *Light Metal Age,* v. 15, June 1957, p. 19-20. (CMA)

The hazards in the processing, fabrication and use of titanium are slight but must be recognized. Fires from titanium turnings and particles are minimized by using sufficient cutting fluid and frequent removal of the titanium waste. Precautions are necessary in chemical cleaning. Cooling and slow bleeding in dry air prevent ignition of the contents in sponge manufacture. Handling titanium fines and powder requires the most care. Cool, ventilated storage places are best. The AEC recommendation for extinguishing fires in titanium is to spread dry dolomite around the area and over it until coverage is complete. Burning powder should be removed from cement to prevent explosions.
(A7p; Ti)

308-A. Columbium and Its Uses. G. L. Miller. *Materials and Methods,* v. 45, May 1957, p. 131-135.

Availability, methods of production, mechanical and physical properties; effect of high temperatures on these properties; properties of columbium alloyed with molybdenum, platinum, tantalum, titanium, tungsten, vanadium or zirconium. Potential applications are nuclear reactors, jet engines and chemical industry. 21 ref. (A general; Cb)

309-A. Where to Use Heat Resistant, High Alloy Castings. E. A. Schoefer. *Materials and Methods,* v. 45, June 1957, p. 122-125, 150-155.

Illustrated guide to the selection of castings of heat resistant Fe-Cr-Ni alloys for use as recuperators, ore roasters, burner nozzles, oil refinery heaters, heat treating furnace components; data on alloy types, their composition, physical properties, mechanical properties, elevated-temperature properties, fabricating possibilities and uses.
(A general, W27p, 17-7; SGA-h, 5)

310-A. Copperbelt of Northern Rhodesia. *Mining Engineering,* v. 9, May 1957, p. 517-523.

History of copper mining and refining in Rhodesia; ore type and reserves, present installations and future of industry.
(A4n, B general, C general; Cu, RM-n)

311-A. Mining East Texas Iron Ore. V. F. Malone. *Mining Engineering,* v. 9, May 1957, p. 524-527.

Nature and extent of ore deposits; mining methods and beneficiation process. (A11a, B12, B14; Fe, RM-n)

312-A. Aluminum Overseas. *Modern Metals,* v. 13, May 1957, p. 112.

Expansion of bauxite mining, aluminum reduction and fabrication facilities is planned or under way in Africa, Australia, India, Ireland, Japan, Spain and South America.
(A4n, B general, C general; Al)

313-A. Evaluation of Data on Zirconium-Uranium Alloys. F. A. Rough. *U.S. Atomic Energy Commission,* BMI-1030, Aug. 19, 1957. 105 p. (CMA)

The literature pertaining to U-Zr alloys was surveyed and the available data analyzed. Attempts have been made to reconcile the divergent forms of the phase diagram. Features discussed are the structure of the epsilon-phase, two modes of transformation for the beta-phase, the typical microstructures produced by the transformation, by cold working and by annealing, hardness, tensile and creep data, and physical properties. Techniques for hot and cold rolling, extruding and swaging. Corrosion resistance is reviewed and the effect of additions on it is discussed. (A general; Zr, U)

314-A. Applications, Properties and Fabrication of Thermenol Type Alloys. J. F. Nachman and W. J. Buehler. U.S. Navy, Bureau of Ordnance, Report 4237. *U.S. Office of Technical Services,* PB 121098, May 1956, 52 p. (CMA)

Thermenol (Fe-Al-Mo) is a magnetic, refractory and nonstrategic alloy. Other properties discussed include hardness, tensile properties, stress-rupture properties, and corrosion and oxidation resistance. Alloy preparation and its hot and cold working described.
(A general; SGA-h, Fe, Al, Mo)

315-A. New High Temperature Intermetallic Materials. R. D. Grinthal. U.S. Air Force, Wright Air Development Center, Technical Report 53-190. Pt. 5. *U.S. Office of Technical Services,* PB 121891, Nov. 1956, 65 p. (CMA)

Data reported for the effect of a copper additive on the heat treatment, oxidation resistance and physical properties of $MoSi_2$. X-ray diffraction was used to identify 11 compositions in the Cr-Ti-Si system. The Ti-Al-Ni system was studied in the triangular region which includes NiAl, NiTi and TiAl. The effect of adding copper to Cr_2Ti was determined. X-ray oxidation and physical data are reported.
(A general, M24d, 2-10; SGA-h)

316-A. (French.) **Uranium Ore Deposits at Entraygues (Aveyron).** R. Pulou. *Sociéte d'Histoire Naturelle de Toulouse, Bulletin,* v. 91, May 30, 1956, p. 175-190.

Geology of region; description of pitchblende and of previously undiscovered phosphated ores; study of uranium-bearing ores found in area. 10 ref. (A4n; U, RM-n)

317-A. (German.) **Checking Production and Controlling Waste.** Helmut Schrader. *Giesserei,* v. 44, June 6, 1957, p. 350-351.

Classification of the rejected material into main and secondary groups; recording waste by means of a card index. (A8; RM-q)

318-A. (German.) **Status of and Trends in the Development of the Metallurgy of Titanium.** L. F. Gillemot. *Neue Heutte,* v. 2, Feb-Mar. 1957, p. 84-91. (CMA)

The current status of the metallurgy of titanium and recent developments in the art. Much of the review is devoted to a fairly detailed description of the reduction of titanium tetrachloride with magnesium or sodium.
(A general, C26; Ti)

319-A. (Book.) **Applied Metallurgy for Engineers.** Malcolm S. Burton. 407 p. 1956. McGraw-Hill Book Co., Inc., 330 W. 42nd St., New York 18, N. Y. $7.50.

Text for survey courses in metallurgical technology. Discussion of techniques and illustrations of industrial equipment are included but are secondary to presentation of metallurgical principles. Questions and list of references conclude each chapter. (A general)

320-A. (Book.) **Manufacturing Processes, 4th Ed.** Myron L. Begeman.

612 p. 1957. John Wiley & Sons, Inc., 440 Fourth Ave., New York 16, N. Y. $8.

Three entirely new chapters appear: manufacturing processes; metal cutting; and electroforming and coating processes. Conforming to recent developments, all other chapters were revised and particularly those on welding, heat treatment of steel, press work, plastic molding, melting and metal casting, and foundry equipment and procedures. (A general, 18)

321-A. (Book—Italian.) **Plastic Working of Light Alloys.** C. Panseri. 846 p. 1956. Editoriale Hoepli, Milan, Italy.

History of aluminum; production of ingots for plastic working; theory of plastic deformation; hardening, crystalline orientation and recrystallization; heat treatment; corrosion resistance; all types of hot and cold working; machining; joining; finishing, surface conditioning and coating; hardened, standard and improved alloys; alloys for special applications; appendix of standards, atomic weights, conversion temperatures, etc. (A general; Al)

322-A. Properties and Control of Electric-Arc Steel Furnace Fumes. Richard S. Brief, Andrew H. Rose and David G. Stephan. *Air Pollution Control Association, Journal,* v. 6, Feb. 1957, p. 220-224.

An industry-wide survey providing much new data. (A8a, D5)

323-A. New Ilmenite Deposits Found. *Chemical and Engineering News,* v. 35, July 1, 1957, p. 21. (CMA)

An ilmenite deposit has been found in New Jersey, extending from Lakewood to Camden and ten miles wide at the broadest point. More deposits are sought. A chemical firm has contracted with Rutgers University to assay the content of the deposits. Soaring land values in the area complicate the economic situation. (A4n; Ti, RM-n)

324-A. Manganese From Low-Grade Ore. *Chemical and Engineering News,* v. 35, July 22, 1957, p. 70.

Canadian process recovers manganese from iron ore tailings; gives high-grade iron as by-product. Manganese sulphate monohydrate is selectively leached from pyrolusite-type ores; elemental manganese is produced electrolytically.
(A11d, C19n, C23p; Mn, RM-n)

325-A. New Horizons for Lithium. P. E. Landolt. *Journal of Metals,* v. 9, June 1957, p. 766-768.

Growth in the consumption of lithium products and metal; ore reserves in U.S. and Canada; methods of concentration and treating ore. 11 ref.
(A4p, A11a, B general; Li, RM-n)

326-A. Waste Disposal Problems in the Metals Finishing Industries. George E. Barnes and Leon W. Weinberger. *Southern Municipal and Industrial Waste Conference, Proceedings, 5th Conference,* Apr. 1956, p. 201-215.

Disposal or recorvery of pickling liquors, cleaning chemicals, metal dust, heavy metals, cyanides, dyes and oils. 4 ref. (A8b, L general)

327-A. Metal Plating Wastes in Municipal Sewerage Systems. F. W. Kittrell. *Southern Municipal and Industrial Waste Conference, Proceedings, 5th Conference,* Apr. 1956, p. 216-227.

Handling of metals, oils, detergents and chemicals. 27 ref.
(A8b, L17)

328-A. Safe Operation of Atmosphere Furnaces. Jack Huebler. *Steel Processing,* v. 43, June 1957, p. 337-340, 342-343.

Recommendations of safeguards which represent accumlated experiences with a wide variety of operations. (A7p, J2k)

329-A. Copper Mines and Prospects Adjacent to Landlocked Bay, Prince William Sound, Alaska. Miro Mihelich and R. R. Wells. *U. S. Bureau of Mines, Report of Investigations 5320,* Apr. 1957, 21 p.

Where accessible for sampling, the copper content of the deposits ranged from a few hundredths of a percent to over 8%; zinc, gold and silver are present in negligible amounts. Flotation tests of a sample composited to represent typical mine-run ore indicate that 81% of the copper is recoverable in a product assaying 28% copper at a concentration ratio of 17.5:1. (A4n; Cu)

330-A. (English.) **Ilmenite-Magnetite Ore Field in Finland.** V. Paeaekkoenen. *Finland Geologinen Tutkimuslaitos, Bulletin 171,* 1956, 87 p. (CMA)

The Otanmaeki field of ilmenite and magnetite is described geologically and details of the ore deposits are given, including microscopic

features of the ore rock, ore types, metal content of different areas, and structure of the ore rocks. Similarities and differences are noted with the Norwegian fields of Roedsand, Titania and Glaafjeld.
(A4n; Ti, RM-n)

331-A. (French.) **Renewed Interest in the Metal Mines in Albigeois and the Maure Mountain Region.** V. Charrin. *Génie Civil,* v. 134, May 1, 1957, p. 206-208.

New tungsten deposits found in the Albigeois region, which also has iron ores, pyrites, manganese, copper, silver, lead, zinc. Maure Mountain area has zinc, lead, silver, copper, all apparently worth commercial exploitation.
(A4n, W, Fe, Mn, Cu, Ag, Pb, Zn, RM-n)

332-A. (French.) **Molybdenum; Its Extraction, Its Metallurgy.** R. E. Warriner. *Metallurgie et la Construction Mecanique,* v. 89, June 1957, p. 539-546. (CMA)

A review of molybdenum technology covers recovery from its various ores, reduction to the metal, production of chemical compounds (particularly the pure oxide), world consumption, and properties and applications of molybdenum alloys and compounds. (A general; Mo)

333-A. (German.) **Scientific Background of the Production of Metallic Tungsten for the Electrical Lamp Industry and Factors Influencing Its Quality.** T. Millner. *Acta Technica,* v. 17, 1957, p. 67-111.

Summary of research and technology underlying Hungarian tungsten production for the lamp industry. Chemical, physical and mechanical properties of tungsten wire. 61 ref. (A general, T1a, 17-7; W)

334-A. (German.) **Waste Water in the Electroplating Industry.** Robert Weiner. *Metallwaren-Industrie und Galvanotechnik,* v. 48, Feb. 1957, p. 50-72.

Types of waste water; permissible concentration of contaminants, methods of decontamination, practical application of decontamination, analyses of waste waters. 14 ref.
(A8b, L17)

335-A. (German.) **Clarification of Toxic Waste in Electroplating Concerns.** Joseph Wittmann. *Metallwaren-Industrie und Galvanotechnik,* v. 48, Feb. 1957, p. 81-86.

Plans, calculations and actual experience in building a waste water treatment system. (A8b, L17)

336-A. (German.) **Rhenium and Its Extraction in the Mansfield Smelting "Wilhelm Pieck" Works.** Georg Lindemann. *Neue Hütte,* v. 2, Feb-Mar. 1957, p. 200-203.

Discovery of rhenium and its occurrence in Mansfield copper slate; early extraction from blast furnace salamanders; present-day extraction from lead-zinc flue dust; its chemical and physical properties, applications. 4 ref.
(A8a, A8d, A11a; Re, 17-7)

337-A. (German.) **Economics of Pig Iron Production in the German Democratic Republic.** Joachim Tischendorf and Hans-Georg Strauss. *Neue Hütte,* v. 2, May 1957, p. 269-280.

Raw material; blast furnace and low shaft furnace; blooming process; acid melting; ore mixing and preparation. 19 ref.
(A4p, B general, D general; ST, RM-n)

338-A. (Japanese.) **Aluminum and Its Alloys as Construction Material.** Toyoji Shioda. *Metals,* v. 27, June 1957, p. 459-465.

Mechanical properties, applications, heat treatments and corrosion resistance of pure aluminum, aluminum-manganese alloys, aluminum-magnesium-silicon alloys, aluminum-copper alloys, aluminum-copper-magnesium alloys and aluminum-zinc-copper-magnesium alloys.
(A general; Al)

339-A. (Japanese.) **Super-Heavy Alloys.** K. Nishizama. *Metals,* v. 27, June 1957, p. 467-472.

Alloys of tungsten with nickel or copper are described. Machinabilities, thermal and electric conductivities and mechanical properties are described. Applications, especially from the viewpoint of absorption efficiency of emmission spectra, are given. 7 ref.
(A general, W, *Ni, Cu*)

340-A. (Polish.) **National Income Versus Steel Production.** Kazimierz Andrysik. *Hutnik,* v. 24, Jan. 1957, p. 18-22.

Statistical data of national income and steel production of U. S. A., U. S. S. R. and Poland. 12 ref.
(A4; ST)

341-A. **Titanium Mineral Developments in Australia.** *Chemical Engineering and Mining Review,* v. 49, Sept-Oct. 1956, p. 59-62. (CMA)

Production and export statistics for 1948-56 are given for rutile and

ilmenite mineral production from the East and West coasts of Australia. The consumption of rutile in the U. S. is not expected to exceed 75,000 tons, 57,000 tons of which would supply the metal producing industry. U. S. imports may come partly from Mexico. United Kingdom's demand for rutile is about 3500 tons annually for metal production. During 1957 the bulk of ilmenite exported will go to Japan. (A4n; Ti, RM-n)

342-A. Distribution of Nickel in the Lambertville Diabase. Thomas W. Storm and Heinrich D. Holland. *Geochimica et Cosmochimica Acta,* v. 11, no. 4, 1957, p. 335-347.

The concentration of nickel in plagioclase, pyroxene and magnetite in the diabase sill exposed south of Lambertville, N. J., has been determined colorimetrically. It was found that almost all of the nickel is contained in the pyroxene and magnetite, and that the concentration of nickel in these fractions decreases markedly toward the top of the sill. 6 ref. (A11a; Ni_2, RM-n)

343-A. Titanium. Maurice Cook. *Industry and Mining Standard,* v. 112, June 20, 1957, p. 11-12, 14. (CMA)

History, extraction processes, useful properties and applications of titanium. The American chemical industry has used titanium in many places, and in Britain titanium components are being evaluated in plants handling fertilizers, ammonia, sulphuric acid and oil derivatives. (A general; Ti, 17-7)

344-A. Some Aspects of Progress in the Nickel Industry. L. B. Pfeil. *Journal of the Institute of Metals,* v. 85, July 1957, p. 457-461.

Recent advances in prospecting for nickel ores, ore concentration and smelting and refining of nickel; present-day applications. (A general, B14, C21; Ni, 17-7)

345-A. New Techniques Aid Metallurgical Research at the N. P. L. E. I. Brimelow. *Metallurgia,* v. 56, July 1957, p. 9-12.

Work of the Metallurgy Division of the National Physical Laboratory includes brittleness in iron, X-ray diffraction and radioactive tracer techniques, creep and fatigue, magnesium alloys, and effect of fire on tensioned wires of prestressed concrete. 3 ref. (A9h)

346-A. Geology of the Questa Molybdenum (Moly) Mine Area, Taos County, New Mexico. J. H. Schilling. *New Mexico Institute of Mining and Technology, Bulletin 51,* 1956, 72 p. (CMA)

The veins are largely quartz and molybdenite, with locally abundant biotite, fluorite, pyrite, chalcopyrite, calcite and rhodochrosite, and were deposited as cavity fillings in late Tertiary time. Large low-grade deposits of molybdenite may occur around the margins of the granite stocks. (A11a; Mo, RM-n)

347-A. Scoreboard for 15 Rare Metals, Their Status, Prospects. *Steel,* v. 141, July 1, 1957, p. 44-45.

U. S. consumption, production, reserves, stockpiles and research. (A4p, A9; EG-b)

348-A. Tool Steel Selection. *Tool Engineer,* v. 39, July 1957, p. 121-124.

Guide to selection of proper grades of toolsteel for approximately 400 applications. (A general; TS, 17-7)

349-A. Investigations of Rhenium. C. T. Sims. Battelle Memorial Institute (Wright Air Development Center). *U. S. Office of Technical Services,* PB 121653, Sept. 1956, 86 p. $2.25.

Basic physical, mechanical and electronic properties, with emphasis on the future electronic and electrical uses of the highly promising metal. A new method was developed for preparation of high-purity rhenium powder by reduction of a hydrolyzed rhenium halide. Electrical resistivity and specific heat were investigated from room temperature to about 2300° C. Electromotive forces generated by some rhenium-alloy thermocouples also were studied. (A general, T1, 17-7; Re)

350-A. (French.) **Growth of the Aluminum Industry in the United States.** G. A. Baudart. *Revue de l'Aluminium,* no. 244, June 1957, p. 601-604.

The U. S. is now the world's largest producer of aluminum, 1,523,-000 tons in 1956 in a world total of 3,400,000 tons—a 45% share. Reviews the history of the aluminum industry and describes future plans of expansion through 1959. (A4p, A2; Al)

351-A. (Italian.) **Etruscan Mines and Metalworking Plants.** Giuseppe Caneva. *Fonderia Italiana,* v. 6, Apr. 1957, p. 162-165 and p. 175.

Locations of deposits assumed from surviving evidence to have been worked in the Etruscan period; mining and manufacturing methods. 4 ref. (A2, B12)

352-A. (Japanese.) **Titaniferous Iron Sand Deposits at Shikabe-Mura, South-**

ern **Hokkaido.** T. Banba and T. Igarashi. *Geological Survey of Japan, Bulletin,* v. 7, 1956, p. 35-40. (CMA)

Alternating sand layers near Shikabe village contain titaniferous magnetite. The main deposits are located along rivers and are underlain with agglomeratic gravel. Total ore tonnage is estimated at five million tons, averaging 15% iron and 2% titania. (A4n; Ti, Fe, RM-n)

353-A. (Rumanian.) **Titaniferous Iron and Zirconium Alluvial Deposits, New Raw Material Source for the Titanium Industry.** O. Maieru and C. Superceanu. *Revista de Chimie,* v. 7, Mar. 1956, p. 145-147. (CMA)

A new source of raw materials for titanium production, located in the region of Fagaras, in the Carpathian Mountains, contains mainly ilmenite, zircon and garnets. Concentrations of 17-27% Ti and 0.3-0.4% Zr were obtained. 3 ref. (A11a; Ti, Zr, RM-n)

354-A. (Rumanian.) **Raw Material Bases.** C. Superceanu and O. Maieru. *Revista de Chimie,* v. 8, Apr. 1957, p. 221-227. (CMA)

A new source of raw material for the chemical-metallurgical industry of titanium and zirconium products comprises the alluvial deposits at Fagaras in the Carpathian Mountains. Average concentrations of about 1-3 kg. per cu. m. of ilmenite, rutile and zircon were found, from which final concentrations of 40% TiO_2 and 20% ZrO_2 were obtained. 4 ref. (A11a; Ti, Zr, RM-n)

355-A. (Rumanian.) **Investigation of the Production Possibilities of a Titanium Concentrate From Domestic Alluvial Sands.** L. Cobrescu and Inna Giurcanu. *Revista de Chimie,* v. 8, Apr. 1957, p. 227-230. (CMA)

Considerable variations in the quantities of useful and sterile minerals were found in the alluvial sand of the domestic alluvium containing ilmenite, magnetite, garnet and rutile. First concentrations of 0.7-2% TiO_2 were obtained at 0.5 mm., permitting final concentrations to about 40%. 5 ref. (A11a, B14; Ti, RM-n)

356-A. (Book.) **American Bureau of Metal Statistics, Yearbook.** 133 p. 1956. American Bureau of Metal Statistics, 50 Broadway, New York 4, N. Y. $3.

World production statistics of nonferrous metals (copper, lead, aluminum, gold and silver) listed by country. Details of consumption, exports, imports, prices, ore reserves and refining of these metals. (A4; EG-a)

357-A. (Book.) **Yearbook of the American Iron and Steel Institute, 1956.** 268 p. American Iron and Steel Institute, 150 E. 42nd St., New York 17, N. Y.

Proceedings of the 64th general meeting of the Iron and Steel Institute of May 23-24, 1956. Three papers abstracted separately. (A general, D general; ST)

358-A. (Book.) **American Society for Metals, Transactions, v. 49, 1957.** American Society for Metals, 7301 Euclid Ave., Cleveland 3, Ohio. $10.

Papers, lectures and reports presented at the 38th Annual Convention, Oct. 6-17, 1956. The Campbell Memorial Lecture by C. S. Barrett is abstracted separately; other papers were abstracted as preprints in 1956. (A general)

359-A. (Book.) **Metallurgy of the Rarer Metals. Pt. 5. Molybdenum.** L. Northcott. 222 p. 1956. Butterworths Scientific Publications, 33 Kingsworth WC2, London. (CMA)

History, occurrence and uses of molybdenum; extraction; physical properties; powder metallurgy; arc melting; fabrication; mechanical properties of molybdenum and its alloys; oxidation and protection of molybdenum. (A general; Mo)

360-A. (Book.) **Northern Rhodesia Chamber of Mines Year Book.** 1956. 126 p. Northern Rhodesia Chamber of Mines, Kitwe, Northern Rhodesia.

Information and statistics concerning the Northern Rhodesia copper mining industry. (A4n, B12; Cu, RM-n)

361-A. (Book.) **Handbook of Hard Metals.** W. Dawihl. 162 p. 1957. Philosophical Library, Inc., 15 E. 40th St., New York 16, N. Y. $10.

An abridged translation of "Handbuch der Hartmetalle". First part deals with scientific principles of sintering; second part with technical production of hard metals. (A general, H general; SGB-q)

362-A. **Reporting and Analyzing Production in a Swedish Steel Plant.** C. Jan Yngstrom. *American Society for Quality Control, National Convention Transactions,* May 1957, p. 549-558.

Reporting routines employed at Domnarfvet Iron & Steel Works. Products include hot rolled plate, rails and beams, sections, rods and

strips. Decentralized production reporting found more efficient than centralized reporting. (A5d; ST)

363-A. Lanthanum. L. Sanderson. *Canadian Mining Journal,* v. 78, Aug. 1957, p. 111-112. (CMA)

Physical and chemical properties, separation and analysis of lanthanum. Electrolytic method for separating lanthanum from other lanthanons and chemical reduction of the chloride with potassium. Lanthanum salts are used for coloring phosphorescent preparations and the oxide is a useful constituent in ceramics. Lanthanum alloys are used as pyrophorics. The addition of lan thanum to ferrous alloys produces a hardening effect.
(A general; La, 17-7)

364-A. No Is Nobelium. *Chemical and Engineering News,* v. 35, Aug. 19, 1957, p. 30.

Element 102, the next to last element in the actinide series to be isolated, has been officially named nobelium, for which the symbol is No. The Commission on Inorganic Nomenclature of the International Union of Pure and Applied Chemistry named the new element. Three other symbols have been officially adopted by the commission—Es for einsteinium, Ar for argon, and Md for mendelevium.
(A general; EG-h31)

365-A. New Punched Card System Will Help You Organize Corrosion Data. G. T. Garrett and O. Osmon, Jr. *Chemical Engineering,* June 1957, p. 342-348.

System used at American Potash and Chemical Corp. 5 ref.
(A14e, R general)

366-A. Zirconium. *Columbia Southern Chemicals,* v. 2, no. 2, Summer 1957, p. 16-19. (CMA)

Occurrence and properties of zirconium. The desirability of separating hafnium from zirconium when the latter is used in nuclear reactors. Columbia-National Corp. has contracted with the AEC to produce hafnium-free zirconium, and a plant for the purpose is being constructed near Pensacola. Flow sheet of the basic steps in converting zircon to zirconium.
(A general, C general; Zr)

367-A. Fume Exhaustion in the Plating and Allied Industries. D. J. Fishlock. *Electroplating and Metal Finishing,* v. 10, June 1957, p. 184-191.

Features of fume exhaust systems and materials for exhaust system. (A8a)

368-A. Fume Extraction From Arc Furnaces. J. Bain. *Foundry Trade Journal,* v. 102, June 20, 1957, p. 763-764.

Problem of fume from arc-melting furnace; results obtained on installation of extraction unit and wet scrubber for their disposal at English steel foundry.
(A8a, E10r, 1-2; ST)

369-A. Magnesium and Its Alloys. M. W. Mote and R. J. Jackson. *Materials in Design Engineering,* v. 46, July 1957, p. 115-134.

Properties, fabrication and uses of magnesium alloys now commercially available. (A general; Mg)

370-A. Science for Electroplaters. Pt. 26. Waste Disposal. L. Serota. *Metal Finishing,* v. 55, July 1957, p. 58-60.

Recovery of silver, zinc, copper, cyanide, chromic acids and other materials from cyanide plating baths, chromic anodizing baths, etc.; use of lagoons in disposing of wastes. (A8b; Ag, Zn, Cu)

371-A. Beryllium and Beryllia. L. David. *Metal Industry,* v. 90, June 21, 1957, p. 519-521.

Low neutron absorption makes beryllium and beryllium oxide suitable for use as reflectors and moderators in nuclear reactors; other chemical and physical properties. Processes used in fabrication, machining and joining. (To be continued.) (A general; Be, 17-7)

372-A. Beryllium and Beryllia. L. David. *Metal Industry,* v. 90, June 28, 1957, p. 546.

Physical properties, mechanical properties and uses of beryllium oxide in applications requiring strength and hardness at high temperatures; manufactured forms and available grades of beryllium oxide. 4 ref.
(A general; Be)

373-A. World Copper Resources. H. J. Miller. *Metal Industry,* v. 91, July 12, 1957, p. 23-25.

World reserves and production, primary metal production and copper recovered from scrap. (To be continued.) (A4p, A11; Cu, RM-p)

374-A. World Copper Resources. H. J. Miller. *Metal Industry,* v. 91, July 19, 1957, p. 49-50.

Copper deposits and production of copper in the United States and Rhodesia. (To be continued.) (A11a; Cu)

375-A. Superpurity Aluminum. E. A. Bloch and P. H. Muller. *Metal Progress,* v. 72, Aug. 1957, p. 91-96.

Aluminum 99.99+% pure is made in tonnage for about twice the price of commercial (99.0+) metal. Its uses depend on improved conductivity, corrosion resistance, reflectivity and finish. It is made in a three-layer cell by electrolysis of Al-Cu alloy through a fusible electrolyte of mixed fluorides. Metal of 99.999% purity can be produced by a special technique. (A general, C23p; Al-a, 17-7)

376-A. Our Long-Term Metal Needs. A. Graham Thomson. *Mining Journal* (Annual Review). May 1957, p. 4-7.

Estimates of per capita consumption during next 30 years; copper, lead, zinc, tin, aluminum and steel. (A4p; Cu, Pb, Zn, Sn, Al, ST)

377-A. Metal Coating Research at the Sketty Hall Laboratories of the British Iron and Steel Research Association. S. S. Carlisle. *Sheet Metal Industries,* v. 34, June 1957, p. 405-420.

Facilities and objectives in steel coatings research; research in the field of surface preparation, surface physics, coating by electrodeposition, organic coating, hot metal coating practices, properties of coating and strip processing technology. 22 ref. (A9h, L general)

378-A. (French and German.) **Characteristics of Aluminum Foil.** E. Amann. *Aluminium Suisse,* v. 7, May 1957, p. 86-91.

Physical, chemical and technological properties of aluminum foil. Light-gage foil ranges from 0.005 to 0.05 mm. and heavy-gage from 0.025 to 0.3 mm. The former is used primarily in the manufacture of capacitators, packaging, building insulation and household wrapping, the latter in electrolytic condensers bottle caps and strip for deep drawing of cans. (A general, T general; Al, 4-6)

379-A. (German.) **Heat and Power Supply System of an Integrated Iron and Steel Works.** Hans Weineck. *Stahl und Eisen,* v. 77, July 25, 1957, p. 988-998.

Combined system of gas utilization; distribution of the gross heat consumption; development of specific heat consumption and of blast furnace gas distribution; blast furnace gas piping system; regulation of power station boilers; blast furnace gas losses; heat consumed for heating purposes (openhearth furnaces, rolling mills); reorganization of steam generation; waste heat utilization. (A11e, D general, Fe, ST)

380-A. (German.) **Power and Heat Economy of an Integrated Iron and Steel Works.** Fritz Stolzenberg and Hermann Tiemeyer. *Stahl und Eisen,* v. 77, July 25, 1957, p. 998-1006.

Layout of the plant and flow of materials; development of production and heat consumption; effect of new plants; generation of current and steam; water supply. (A11e, W10; ST)

381-A. (Italian.) **Titanium.** *Acciaio Inossidabile,* v. 24, Mar-June 1957, p. 68-74. (CMA)

General outline of physical, mechanical and technological properties of titanium and its industrial applications. (A general, 17-7; Ti)

382-A. (Japanese.) **Manufacturing of Ferro-Alloys.** *Electrochemical Society of Japan, Journal,* v. 24, Dec. 1956, p. 690-691.

Japanese ferro-alloy industry; production statistics, manufacturing problems and research program. 31 ref. (A4, C general; Fe, AD-n)

383-A. (Japanese.) **Electrolytic Iron and Steel.** *Electrochemical Society of Japan, Journal,* v. 24, Dec. 1956, p. 691-692.

Japanese production of electrolytic iron and steel; technology, costs, production statistics. (A4p, C23; Fe, ST)

384-A. Development of Cast Iron-Base Alloys of Austenitic Type for High Heat Resistance and Scale Resistance. F. Eberle, J. H. Hoke and W. E. Leyda. Babcock & Wilcox Co. Research Center. (Wright Air Development Center), *U. S. Office of Technical Services,* PB 121950, Jan. 1957, 99 p. $2.50.

Development of iron-base alloys to substitute for the cobalt-base alloy H.S. 21. The most promising alloys contained a minimum iron content of 45%, minimum carbon 0.50%, chromium not less than 20%, and between 27 and 32% nickel, part of which could be replaced by cobalt. Those alloys, strengthened with 5% additions of Cb, Ta, Mo and

W, developed a creep-rupture strength at 1600 to 1800° F. approaching that of H.S. 21.
(A general, Q3m, 2-12; SS, SGA-h)

385-A. (French.) **Ore Searches and Statistical Methods.** P. Laffitte. *Annales des Mines,* Feb. 1957, p. 109-112.

Method of "calculation of probabilities" in assessing mineral deposits. (A4n, S12; RM-n)

386-A. (Italian.) **Precipitation Hardening Stainless Steels.** *Nickel,* no. 68, June 1957, p. 1-6.

General properties of these steels; heat treatments that can influence their mechanical and physical properties; welding, pickling, applications. Tables give composition and data on mechanical properties of wrought (martensitic, semi-austenitic, austenitic) and cast types.
(A general, Q general; SS)

387-A. (Japanese.) **New Anticorrosive High-Strength Aluminum Alloy "SZX".** Masahide Kosaki, Rihei Kawachi and Toshio Amitani. *Sumitomo Metals,* v. 9, Jan. 1957, p. 1-4.

Copper improves the mechanical properties of aluminum alloy hardened by the precipitation of Mg_2Si, yet lowers the corrosion resistance. Therefore, a rate of addition of about 0.25% by weight has been decided upon as the maximum value permissible. The alloy was quenched and artificially aged and has 37-43 kg. per sq. mm. ultimate tensile strength, 33-39 kg. per sq. mm. tensile yield strength and 12-20% elongation. (A general; Al)

388-A. Some Practical Aspects of Handling Lithium Metal. H. C. Meyer, Jr. Paper from "Symposium on Handling and Uses of the Alkali Metals." American Chemical Society, p. 9-15.

Differences in handling are due primarily to its higher melting point, greater hardness and reactivity with nitrogen. Because of its higher melting point, liquid metal is handled at higher temperatures, which increases the hazard from burns. Low-carbon steel, or iron, is the most suitable construction material for use with lithium. 14 ref.
(A7p; Li, 14-10)

389-A. Russian Research and Development Projects. R. Sewell. *British Steelmaker,* v. 23, Aug. 1957, p. 244-245.

Research in iron production, steelmaking, casting and rolling.
(A9, D general, E general, F23)

390-A. Nemegosenda Lake—Columbium Area. G. E. Parsons. *Canadian Mining Journal,* v. 78, Aug. 1957, p. 83-87.

Brief historical and general geological account. Columbium occurs in mineral pyrochlore. Ore zones located to date are in a metasomatic aureole surrounding an alkalic syenite plug. Sufficient ore is indicated to support a substantial operation. 2 ref. (A11a; Cb, RM-n)

391-A. Columbium-Uranium Deposits at North Bay, Ont. J. E. Gill and O. E. Owens. *Canadian Mining and Metallurgical Bulletin,* v. 50, Aug. 1957, p. 458-464.

Occurrence, concentration and associated minerals of uranian pyrochlore as determined by diamond drilling on and near group of islands in Lake Nipissing. 6 ref.
(A11a; Cb, U, RM-n)

392-A. What Are Stainless Steels? Joseph Winlock. *Foote Prints,* v. 29, no. 1, 1957, p. 19-29.

History of development of ferritic, martensitic and austenitic stainless steels; characteristics, mechanical properties, composition and typical examples of each group.
(A general; SS)

393-A. Will Titanium Beat Setbacks? G. J. McManus. *Iron Age,* v. 180, Sept. 5, 1957, p. 71-72. (CMA)

The titanium outlook after the defense cutbacks in the spring of 1957. Shipments are expected to be less than 7000 tons in 1957 and may drop to 4000 tons in 1958; inventories have also been reduced. Although the setback is serious, confidence in the future of titanium remains strong. Rem-Cru says that commercial shipments are six times what they were last year. Commercial supply is no problem today and prices have been falling.
(A4q; Ti)

394-A. New Metallurgical Laboratory. *Metal Industry,* v. 91, July 26, 1957, p. 69-70.

Facilities in new laboratory of British Welding Research Association. (A9h, K general)

395-A. World Copper Resources. H. J. Miller. *Metal Industry,* v. 91, July 26, 1957, p. 71-73.

Copper mining, refining, production and nature of ore deposits in Chile, Belgian Congo, Canada and Peru. (To be concluded.) (A4; Cu)

396-A. Rare Earth Elements in California. L. C. Pary. *Mining Magazine,* v. 47, Aug. 1957, p. 113-116. (CMA)

The Mountain Pass, Calif., deposits of bastnaesite are described. The "rare earths" are defined and their occurrence, mineralogy, use and prospects are reviewed. Precise data on Mountain Pass ore reserves are unavailable, but nearly all are in the Sulphide Queen ore body which covers a 20-acre area. Open-pit quarry operations are carried out on several faces of the deposit. (A11a; EG-g, RM-n)

397-A. Metal Resources of New Mexico and Their Economic Features Through 1954. Eugene Carter Anderson. *New Mexico Bureau of Mines, Mineral Resources,* Bulletin 39, 1957, 183 p.

Brief descriptions of all known deposits in the State other than those of iron and manganese. (A11a; RM-n)

398-A. Growing Importance of Platinum. Edith Goldman. *New Scientist,* v. 2, May 2, 1957, p. 32-34.

Production and applications. (A general, 17-7; Pt)

399-A. Low-Nickel Austenitic Stainless Steels. L. F. Spencer. *Product Engineering,* v. 28, p. 135-140.

Experience with "200" series stainless as replacement for straight 18-8 steels as to corrosion, fabrication, forming and welding. (A general; SS)

400-A. (English.) **Symposium on New Metals for the Chemical Industry. Pt. 2. Titanium as a Metal of Construction for the Chemical Industry.** E. Swainson. *Ingenieur,* v. 69, July 12, 1957, p. Ch.103-Ch.111. (CMA)

Review covers extraction and reduction, melting methods, fabrication and machining, welding, and physical, mechanical and chemical properties of the metal and its commercial alloys. Applications in the chemical industry include steam jet diffusers, filter press components, condenser "top-hat", pump impeller, valves, and anodizing racks. 15 ref. (A general, T29, 17-7; Ti)

401-A. (French.) **Present Trends in Magnesium.** *Annales des Mines,* Feb. 1957, p. 104-107.

World production figures 1946-1955; U. S. consumption, 1946-1955, by use categories of magnesium alloys not containing aluminum; brief indication of plant activity in U. S., Canada, Great Britain, and Hungary to improve production techniques and volume. 15 ref. (A4p, 17-7; Mg)

402-A. (French.) **A Look at the Uranium Industry Throughout the World.** Jacques Mabile. *Société des Ingenieurs Civils de France, Memoires,* v. 110, Mar-Apr. 1957, p. 76-84.

Types and locations of deposits and factors involved in exploitation; economics of refining; production to date and probable capacities in different areas of Western World by 1960; resources and known reserves; probabilities of future discoveries. (A4n; U)

403-A. (German.) **Organization of Materials and Production as a Function of Planning and Management.** Werner Schutte, Ulrich Sabass, Hans-Heinrich von Lintig and Anton Schütz. *Stahl und Eisen,* v. 77, Aug. 8, 1957, p. 1045-1064.

Thirty years experience at the Industrial Engineering Department of the August Thyssen-Hütte; supply of materials; prime records; routing cards; inventory control, with punched cards, routing of an order; production planning and scheduling; scheduling orders by route cards; quality control technical cost analysis; relation between technical characteristic data and cost; high-speed cost accounting; production planning and control; long-term and short-term planning. (A5b; ST)

404-A. (German.) **Dust Removal in a Strip Sintering Plant.** Bernhardt Weilandt, Fritz Kruse and Nikolaus Petrusch. *Stahl und Eisen,* v. 77, Aug. 8, 1957, p. 1064-1069.

Dust content of the air; measures to prevent formation of dust; removal of the dust from the waste gases; recovery of the dust. (A8a, B16; Fe, RM-n)

405-A. (German.) **Dust Removal in a Pellet Sintering Plant.** Rudolf Nase. *Stahl und Eisen,* v. 77, Aug. 8, 1957, p. 1070-1074.

Dust removal plants; life of fan rotors; ventilator rotors and cyclones; return of dry dust and mud; settling tank, water cycle and water consumption; data on the quantities, grain sizes and chemical composition of the dusts. (A8a, B16b, 1-2; Fe, RM-n)

406-A. (Hungarian.) **Processing of Vanadium Sludges in Connection With Alumina Production.** Imre Veres. *Kohaszati Lapok,* v. 90, Apr-May 1957, p. 181-184. (CMA)

Foreign and domestic methods for recovery of vanadium from vanadium sludges; salient points of new method. These include cleaning of the sludge by burnt lime or lime milk; treatment with quick lime after acidification to pH 6, which takes care of all contaminants; and the separation of a precipitate containing vanadium oxide, suitable directly for metallurgical purposes. 23 ref. (A11c; Al, V)

407-A. (Italian.) **Zama Alloys for Die Casting. Pt. 2.** Ludovica Alladio. *Rivista di Meccanica,* no. 158, Mar. 30, 1957, p. 19-25.

Preparation of alloys; properties and mechanical working of castings; aging and stabilizing treatment; corrosion and surface finishes.
(A general; Zn, 5-11)

408-A. (Portuguese.) **Continued Progress at Volta Redonda.** *Engenharia, Mineracao e Metalurgia,* v. 25, May 1957, p. 247-248.

The 1956 production figures include 739,996 tons of ingots, 579,079 tons of rolled products, variety of chemical byproducts. Brief survey of medical, housing, educational services provided or supported by this plant of Cia. Siderurgica Nacional. (A4p; ST)

409-A. (Portuguese.) **Iron Ore From Vale do Rio Doce Company.** *Engenharia, Mineracao e Metalurgia,* v. 25, May 1957, p. 266-267.

Caue deposits belonging to Cia. Vale do Rio Doce contain greater part of 15 billion tons of iron ore reserves in State of Minas Gerais. In 1956 2,270,138 long tons of ore was exported (including 16,427 tons of fines), 44.5% of which was bought by U. S. (A4p; Fe, RM-n)

410-A. (Spanish.) **Reflections on the Metallurgy of Iron and Steel.** Jorge A. Riviere Manen. *Instituto del Hierro y del Acero,* v. 10, Apr-June 1957, p. 171-186.

Historical review of processes and technological bases of progress in steelmaking; examination of technico-economic scene in U. S. as exemplified in steel industry; conclusions as to benefits in technical, economic and human betterment to be derived from application to Spanish industry of U. S. type organization and practices.
(A2, A4, D general, Fe, ST)

411-A. (Book.) **Handling and Uses of the Alkali Metals.** Advances in Chemistry Series, no. 19, 1957, American Chemical Society, 1155 16th St., N.W., Washington 6, D. C. 138 p. $4.75.

A collection of papers comprising a symposium presented before the Division of Industrial and Engineering Chemistry at the 129th meeting of American Chemical Society. Pertinent papers abstracted separately.
(A general, 17-7; Li, Na, 14-10)

412-A. (Book.) **Metal Statistics 1957.** 856 p. 1957. American Metal Market, 18 Cliff St., New York 38, N. Y. $3.50.

50th Anniversary edition contains statistical data and Buyers' and Sellers' Guide. (A4)

413-A. (Book.) **Economic Geology of the Bishop Tungsten District, Calif. Special Report 47.** Paul C. Bateman. Aug. 1956, 87 p. Division of Mines, Ferry Bldg., San Francisco 11, Calif. $4.

General description of geology of the district: 54 deposits described, which are, with a few exceptions, tactite. Maps and other illustrations of the better developed and more productive deposits. Procedure for more efficient prospecting is suggested. 31 ref. (A4n; W, RM-n)

414-A. (Book.) **Progress in Nuclear Energy, Ser. 5, Metallurgy and Fuels.** H. M. Finniston and J. P. Howe, Editors. 813 p. 1956. McGraw-Hill Book Co., 330 West 42nd St., New York 36, N. Y. $21.

Collection of contributions dealing with current status of metallurgy in the field of nuclear energy. The nine sections include: production and preparation of uranium metal, thorium, beryllium and zirconium, physical metallurgy of plutonium, preparation and properties of the rare earths, ceramics, fuel elements, effects of radiation and solid-state physics.
(A general, P18, W11p, 17-7)

415-A. (Book.) **Metallurgical Progress-3.** 88 p. 1957. Philosophical Library, Inc., 15 East 40th St., New York 16, N. Y. $6.

Literature reviews on refractories, nondestructive testing, coke, foundry technology and mechanical properties of cast iron. Papers previously abstracted as originally published.
(A general, 10-4)

416-A. (Book.) **1957 SAE Handbook.** 1176 p. 1957. Society of Automotive Engineers, Inc., 485 Lexington Ave., New York 17, N Y. $5.

Compositions, properties, testing methods; SAE standards for ferrous and nonferrous metals; nonmetallic materials; automotive parts,

accessories, and electrical equipment. (A general, S22)

417-A. Regeneration of Waste Pickle Liquor to Produce Ferrous Sulfate Monohydrate. J. S. Atwood, J. S. Joseph, and W. W. Hodge. *Blast Furnace and Steel Plant,* v. 45, Sept. 1957, p. 1018-1023.

Neutralization processes; use of sulphuric acid as a descaling medium and its regeneration; description of process. Above 10,000 gal. per day of waste acid the monohydrate process presents the cheapest disposal method now available. 7 ref. (A8b, L12g)

418-A. Chemicals From Steel Plants. *Chemical and Engineering News,* v. 35, Aug. 26, 1957, p. 19-22.

Table of chemicals produced; economics. (A11c; ST)

419-A. An Integrated Waste Disposal Method. L. E. Lancy. *Electroplating and Metal Finishing,* v. 10, Aug. 1957, p. 251-253.

Treatment of workpieces and wash water with chlorine and sodium hydroxide breaks down cyanide plating solutions, and sulphur dioxide with sodium and calcium carbonates reduce chromate-containing effluent. (A8b, L17)

420-A. Increasing Use of Hazardous Metals Poses New Extinguishing Problems. Roi B. Woolley. *Fire Engineering,* v. 110, Aug. 1957, p. 796-799.

Control of magnesium, zirconium and titanium fires. (A7p; Mg, Zr, Ti)

421-A. Brass Foundry Salvage Practice. Harry St. John. *Foundry,* v. 85, Oct. 1957, p. 121-123.

Importance of segregation of alloys, reclamation processes and refining. (A11d; Cu-n)

422-A. French Steel Industry. *Indian and Eastern Engineer,* v. 120, June 1957, p. 397-400.

Raw material supply, equipment, products, research, economics. (A4, A9, 1-2; ST)

423-A. How to Get More for Your Metalworking Dollar. Pt. 11. Copper and Brass. *Iron Age,* v. 180, Sept. 5, 1957, p. 115-130.

Strength, corrosion resistance, electrical conductivity and other factors involved in selecting correct copper alloy for job at hand; suggestions and techniques for machining, drilling, milling, finishing, forging and joining copper-base alloys. Data on casting alloys; their mechanical and physical properties; casting defects and causes; information on standard wrought copper alloys includes nominal composition; physical properties, mechanical properties, corrosion resistance, fabricating processes and properties. (A general, S22, 17-7; Cu)

424-A. New Materials That the Design Engineer Should Know About. Metallic Materials. Charles R. Simcoe. *Mechanical Engineering,* v. 79, p. 720-724.

Information on newly developed materials including composition and mechanical properties of new titanium alloys, ultra-high-strength steels, nickel-base alloys, and potential uses for beryllium, columbium and rhenium. 7 ref. (A general, 17-7, 17-1; Ti, ST, Ni, Be, Cb, Re)

425-A. Science for Electroplaters. Pt. 27. Waste Disposal. Pt. 3. L. Serota. *Metal Finishing,* v. 55, Aug. 1957, p. 69-71.

Common methods of chemical treatment for toxic wastes in plating operation effluent. (A8b, L17)

426-A. A Survey of Air Treatment Systems in Use in the Metal-Finishing Industries. Leo Walter. *Metal Finishing Journal,* v. 3, Aug. 1957, p. 323-325, 338.

Factors in designing dust or fume exhaust systems. (A8a, L general)

427-A. Manganese, Its Minerals, Deposits and Uses. John N. Hoffman. *Mineral Industries Experiment Station, Pennsylvania State University Circular No.* 49, 1957, 126 p.

Properties, classification, foreign and domestic deposits, consumption and production; bibliography. (A general; Mn, RM-n)

428-A. Water. A Global Problem for Electroplaters. David Milne and D. Gardner Foulke. *Plating,* v. 44, Aug. 1957, p. 859-863.

Approach to water problem centers on economic use; control of effluent water and storage of runoff water, with special emphasis on factors concerning water conservation by electroplating industry. 13 ref. (A11, L17, NM-a38)

429-A. Cyanide Waste—Oxidized in the Plating Room. E. A. Hill and F. J. Neff. *Plating,* v. 44, Aug. 1957, p. 864-868.

Design and operation of alkaline chlorination system of cyanide waste treatment. 4 ref. (A8b, L17)

430-A. Low-Cost Integrated Waste Treatment at American Sterilizer.

John Stroh and Clifford Allen. *Plating*, v. 44, Aug. 1957, p. 869-872.

Case histories of integrated plating waste treatment systems involving wash tank with alkaline chlorination before water rinse to oxidize cyanide wastes, and reduction wash of sulphur dioxide followed by precipitation with sodium and calcium carbonate solutions for treating chromate wastes. (A8b, L17)

431-A. Current Trends in Plating Waste Abatement. C. Fred Gurnham. *Plating*, v. 44, Aug. 1957, p. 873-878.

Engineering design in plating waste treatment and water use. (A8b, L17)

432-A. Bibliography on Metal Finishing Wastes, 1956. C. F. Gurnham and D. G. Foulke. *Plating*, v. 44, Aug. 1957, p. 916-918.

Bibliography lists 55 articles. (A8b, L general, 11-15)

433-A. Aqueous Reprocessing—An Introduction. R. B. Richards. Paper from "Symposium on the Reprocessing of Irradiated Fuels." *U. S. Atomic Energy Commission*, TID-7534, p. 1-21.

Summary and comparison of processes; key development problems; future utilization of aqueous processes. (A11d, T11g, C general)

434-A. Dissolution and Feed Adjustment. R. E. Blanco. Paper from "Symposium on Reprocessing of Irradiated Fuels." *U. S. Atomic Energy Commission*, TID-7534, p. 22-44.

A brief summary of the chemistry of the dissolution and feed adjustment steps. 23 ref. (A11d, T11g; U, Al)

435-A. Redox Process—A Solvent Extraction Reprocessing Method for Irradiated Uranium. S. Lawroski and M. Levenson. Paper from "Symposium on the Reprocessing of Irradiated Fuels." *U. S. Atomic Energy Commission*, TID-7534, p. 45-68.

This process uses Hexone (methyl isobutyl ketone) for solvent extraction, $Al(NO_3)$ for common ion salting effect, and $FE(SO_3NH_2)_2$ and $Na_2Cr_2O_7$ for the reduction and oxidation of plutonium, respectively. (A11d, C19, T11g; Pu)

436-A. Application of the Packed Column to the Redox Process. E. R. Irish. Paper from "Symposium on the Reprocessing of Irradiated Fuels." *U. S. Atomic Energy Commission*, TID-7534, p. 69-82.

Performance characteristics determined for packed solvent extraction columns during development work are capabilities, mass transfer effectiveness, and operating peculiarities. Instrumentation for control and observation of performance is described briefly. (A11d, C19, T11g)

437-A. Purex Process—A Solvent Extraction Reprocessing Method for Irradiated Uranium. E. R. Irish and W. H. Reas. Paper from "Symposium on the Reprocessing of Irradiated Fuels." *U. S. Atomic Energy Commission*, TID-7534, p. 83-106.

A description of the over-all process, utilizing tri-butyl phosphate solvent (in a kerosene-type diluent) and nitric acid salting agent; chemical process flowsheets. The process chemistry of uranium, plutonium, and fission products as affected by process variables. 12 ref. (A11d, C19, T11g)

438-A. Solvent Extraction Processes for Enriched Uranium. C. E. Stevenson. Paper from "Symposium on the Reprocessing of Irradiated Fuels." *U. S. Atomic Energy Commission*, TID-7534, p. 152-179.

Solvent extraction processes for enriched uranium are similar to the Purex and Redox processes for natural uranium except that plutonium separation and recovery is not attempted, and the processes generally must provide for the separation of diluent metals in the fuels. (A11d, C19, T11g; U)

439-A. Thorex Process. F. R. Bruce. Paper from "Symposium on the Reprocessing of Irradiated Fuels." *U. S. Atomic Energy Commission*, TID-7534, p. 180-222.

The Thorex process was developed to recover U^{233} and thorium from irradiated thorium. Thorex pilot plant operating experience over the last two and a half years is reviewed, the current flowsheet presented and evaluated, and recent developments in Thorex process chemistry described. 9 ref. (A11d, C19, T11g; Th, U)

440-A. Auxiliary Processes: Introduction. F. R. Bruce. Paper from "Symposium on the Reprocessing of Irradiated Fuels." *U. S. Atomic Energy Commission*, TID-7534, p. 225-243.

Methods for converting unusual fuels, such as those employed in power reactors, into a solution which is amenable to solvent extraction treatment as practiced in present day reprocessing plants. (A11d, C19, T11g)

441-A. Present Dissolution Methods for Zirconium and Stainless Steel. C. M. Slansky. Paper from "Symposium on the Reprocessing of Irradiated Fuels." *U. S. Atomic Energy Commission,* TID-7534, p. 244-250.

Uranium recovery processes are described for nuclear fuels alloyed and clad with zirconium and with Types 304 and 347 stainless steels. (A11d, C19, T11g; U, Zr, SS)

442-A. Alternate Processing Methods for Zirconium and Stainless Steel Containing Fuels. R. E. Blanco. Paper from "Symposium on the Reprocessing of Irradiated Fuels." *U. S. Atomic Energy Commission,* p. 251-261.

Development program for alternate processing methods for developing universal methods for converting all fuels of a given type, as for example zirconium or stainless steel, to a nitrate form suitable for purification by solvent extraction. A number of methods are surveyed. 13 ref. (A11d, C19, T11g; Zr, SS)

443-A. Removal of Fission Products From Feeds. Merle K. Harmon. Paper from "Symposium on the Reprocessing of Irradiated Steels." *U. S. Atomic Energy Commission,* TID-7534, p. 262-276.

Separation of ruthenium, zirconium, and columbium. (A11d, C19, T11g; Ru, Zr, Cb)

444-A. Tail End Treatment for Zirconium-Niobium Removal. F. R. Bruce. Paper from "Symposium on the Reprocessing of Irradiated Fuels." *U. S. Atomic Energy Commission,* TID-7534, p. 277-285.

Zirconium and columbium are two of the most troublesome fission products associated with uranium recovered by the tributyl phosphate process. It has been found that both of these elements are removed by passage of the uranium product solution through a silica gel bed. 6 ref. (A11d, C19, T11g; Zr, Cb)

445-A. Performance of a Plutonium Reflux Solvent Extraction System. B. F. Judson. Paper from "Symposium on the Reprocessing of Irradiated Fuels." *U. S. Atomic Energy Commission,* TID-7534, p. 296-302.

Semi-works performance of the reflux flowsheet; advantages and disadvantages of employing product refluxing as a solvent extraction technique. (A11d, C19, T11g; Pu)

446-A. Ion Exchange Isolation Processes. F. R. Bruce. Paper from "Symposium on the Reprocessing of Irradiated Fuels." *U. S. Atomic Energy Commission,* TID-7534, p. 303-331.

Ion exchange processes have been developed which both concentrate the fissionable material and give additional separation from corrosion and fission products. The processes were developed specifically for the plutonium product from the Purex and Redox processes and the uranium from the Thorex process. 12 ref. (A11d, C19s, T11g; Pu, U)

447-A. Conversion Chemistry of Plutonium Nitrate. K. M. Harmon and W. H. Reas. Paper from "Symposium on the Reprocessing of Irradiated Fuels." *U. S. Atomic Energy Commission,* TID-7534, p. 332-347.

Procedures in the conversion of plutonium from plutonium nitrate-nitric acid solutions to plutonium metal. (A11d, C19, T11g; Pu)

448-A. Effluent Disposal Considerations and Summary of Methods Used. C. E. Stevenson. Paper from "Symposium on the Reprocessing of Irradiated Fuels." *U. S. Atomic Energy Commission,* TID-7534, p. 351-361.

Problems involved in the disposal of effluent other than products from the chemical processing of nuclear fuels for fissionable material recovery are discussed. Major considerations of effluent treatment are outlined and the types of effluents listed and described. (A8c)

449-A. Retention of High Level Radioactive Wastes. A. M. Platt. Paper from "Symposium on the Reprocessing of Irradiated Fuels." *U. S. Atomic Energy Commission,* TID-7534, p. 389-406.

The operating experience of prime contractors for the United States Atomic Energy Commission in the retention of radioactive wastes by underground tank storage, waste scavenging, and ground disposal techniques. Some of the engineering, economic, and biological hazard aspects of these operations. 5 ref. (A8c)

450-A. Ultimate Disposal of Radioactive Wastes. W. A. Rodger and P. Fineman. Paper from "Symposium on the Reprocessing of Irradiated Fuels." *U. S. Atomic Energy Commission,* TID-7534, p. 407-454.

Methods of discharging liquid wastes to the environment (ocean or earth); several methods of reduction of liquid wastes to solids show promise. 37 ref. (A8c)

451-A. Unit Costs and Economic Relationships for Certain Radioactive

Waste Disposal Steps. F. L. Culler, J. O. Blomeke and W. G. Stockdale. Paper from "Symposium on the Reprocessing of Irradiated Fuels." *U. S. Atomic Energy Commission,* TID-7534, p. 455-475.

A generalized scheme for waste disposal flowsheet is given. Costs have been accumlated or estimated for certain steps in the over-all waste disposal scheme. 6 ref. (A8c, 173)

452-A. Symposium on the Reprocessing of Irradiated Fuels, Held at Brussels, Belgium, May 20-25, 1957. *U. S. Atomic Energy Commission,* TID-7534, 1957, 475 p.

The collection is in three parts (books) dealing with aqueous reprocessing, non-aqueous reprocessing and the engineering and economic aspects of reprocessing. Metallurgical papers are abstracted separately. (A11d, C19, T11g)

453-A. Titanium—A Materials Survey. J. A. Miller. *U. S. Bureau of Mines. Information Circular* 7791, Sept. 1957, 202 p. (CMA)

Chapter headings are: Consumption, properties and uses; mineralogy and geology of titanium deposits; resources; prospecting, mining and beneficiation; processing; fabrication of metal; structure of the industry; supply and distribution; marketing; prices; self-sufficiency and political control; public policy and national defense; selected bibliography. 309 ref. (A general; Ti)

454-A. Literature Survey on Leaded Steels. R. C. Elliott and D. M. Koffman. (Watertown Arsenal Laboratory), *U. S. Office of Technical Services,* PB 111917, July 1955, 38 p. $1.00.

Machining costs can be cut considerably through use of leaded steels where large amounts of machining per unit volume of steel are needed. This conclusion was drawn from an evaluation of published information on the manufacture, fabrication, and properties of leaded steels. The project was undertaken with the aim of utilizing leaded steels for ordnance applications as a means of reducing manufacturing costs. It was found that lead addition to normal steel grades does not decrease ductility or toughness.
(A general, G17k, Q general, T2, 17-7; ST, *Pb*)

455-A. (German.) **The Utilization of High Copper Scrap Metal.** Wilhelm Kaiser. *Zeitschrift für Metallkunde,* v. 48, July 1957, p. 404-409.

Various processes for the recovery of copper from scrap metals are discussed and evaluated as to the losses which must be sustained. New processes, being tried at present, promise to give improved results. (A11d; Cu, RM-p)

456-A. Dust Control in Foundries. W. B. Lawrie, A. T. Holman and J. L. Burgess. *Foundry Trade Journal,* v. 103, Sept. 12, 1957, p. 303-306.

Description of recent work on low-volume high-velocity exhaust system. Good dust control was achieved when operating on dust clouds within the respirable-size range. 6 ref.
(A8a, W13c, 1-2, E general)

457-A. Materials of Construction—Less Common Metals. E. M. Sherwood. *Industrial and Engineering Chemistry,* v. 49, Sept. 1957, p. 1612-1617. (CMA)

Reviews of the literature of the production, properties, alloys, corrosion resistance, and heat treatment of zirconium, hafnium, molybdenum, columbium, tantalum, rhenium and chromium. 143 ref. (A general; Zr, Hf, Mo, Cb, Ta, Re, Cr, SGB-s)

458-A. Materials of Construction—Titanium. H. B. Bomberger. *Industrial and Engineering Chemistry,* v. 49, Sept. 1957, p. 1658-1662. (CMA)

The producers, production statistics, price, properties, and fabrication of titanium are reviewed. A graph shows the corrosion rate of anodized and unanodized titanium in common mineral acids in high concentrations. 72 ref.
(A general; Ti, SGB-s)

459-A. Explosion of a Titanium Crucible. C. E. Armantrout and J. R. Hauger. *Metal Progress,* v. 72, Sept. 1957, p. 94-95. (CMA)

An explosive reaction was observed at a Bureau of Mines laboratory involving titanium and highly oxidizing Na_2O_2-Na_2CO_3 flux. No explosion occurred when a zirconium crucible was substituted.
(A7p; Ti, Zr)

460-A. Titanium Upgraded in New 10 Ft. Vacuum Furnace. *Western Metals,* v. 15, Sept. 1957, p. 54. (CMA)

Much hydrogen-embrittled titanium is being salvaged for the aircraft and missile industry by heating in a vacuum furnace at Hollywood Heat Treating Co. The furnace is 10 ft. deep and 8.25 ft. in diameter, will reach a vacuum of

1/10th micron and a temperature of 2200° F. Extensive electrical equipment is involved.
(A11d, W18, 1-23; Ti)

461-A. Boron-Needled Plain Carbon Cast Steel. Ya. E. Gol'dshtein, L. L. Pyatakova and O. D. Zhizhakina. *Vestnik Mashinostroeniya*, v. 36, no. 7, 1956, p. 23-27. (*Henry Brutcher Translation* no. 3986.)

Previously abstracted from original. See item 166-V, 1956.
(A general; Cn, *B*, 5)

462-A. (French.) **Chronicle of Steelmaking: Historical and Technical Development of the Blast Furnace.** G. Grenier. *Echo des Mines et de la Metallurgie*, no. 3505, June 1957, p. 339-341.

Blast furnaces from wood-burning type of 16th century to present. Contributions of various countries to design, process improvements, etc. 9 ref. (A2, D1, W17g, 1-2)

463-A. (French.) **Chronicle of Steelmaking. Historical Development of Steel-Producing Furnaces.** G. Grenier. *Echo des Mines et de la Metallurgie*, no. 3506, July 1957, p. 406-408.

Thomas converters, Martin furnaces, electric furnaces. 7 ref.
(A2, D general, 1-2; ST)

464-A. (Italian.) **The Technique of Fabrication of Etruscan Mirrors.** C. Panseri and M. Leoni. *Fonderia Italiana*, v. 6, Aug. 1957, p. 309-317.

Chemical, metallographic and sclerometric study of ten mirrors found in graves in various parts of Etruria gives evidence of high technical skill attained by Etruscans in field of bronze metallurgy. 5 ref.
(A2, T9q, 17-7; Cu-s)

465-A. (Italian.) **Augusto Vanzetti, Italian Steel Foundry Pioneer.** B. Boni. *Fonderia Italiana*, v. 6, Aug. 1957, p. 319-327.

Life (1846-1894) and work of man who introduced Roberts converter into Italy and was first director of engineering at Terni Steel Works.
(A2, E general; ST)

466-A. Iron Ore for Britain's Steel. Eric Ford. *British Steelmaker*, v. 23, Sept. 1957, p. 270-271.

Tonnage tables of home ore supplies and imports for 1937, 1954-5-6. Discussion of potential sources for projected increase of 8-10 m. tons imported ore between now and 1962.
(A4p; Fe, RM-n)

467-A. Seeking New Outlets. Cecil H. Chilton. *Chemical Engineering*, v. 64, Sept. 1957, p. 208-209.

Brief survey of nuclear uses, nonnuclear potential of zirconium, hafnium, beryllium and columbium; special properties of these metals; production figures in U. S. plants.
(A4, 17-7; Zr, Hf, Be, Cb)

468-A. Occurrence of Selenium in Sulfides From Some Sedimentary Rocks of the Western United States. R. G. Coleman and Maryse Delevaux. *Economic Geology*, v. 52, Aug. 1957, p. 499-527.

Investigation of nature, amount and distribution of selenium, by means of selenium bearing sulphides, associated with uranium ore deposits of the Colorado Plateau and Wyoming. 33 ref. (A4n; Se)

469-A. A Plan for Establishing an Aluminum Industry Near Rihand Dam, Uttar Pradesh. Balram K. Mahenda. *Geological, Mining and Metallurgical Society of India, Bulletin*, no. 16, Mar. 1956, p. 1-32.

Geological description and characteristics of bauxite deposits of Amarkantuk Plateau; proposed quarrying methods and estimated costs; possible transport facilities; estimate of raw materials required and sources in India; hydro-electric power stations for supply of energy; proposed integrated plant at Annapur in central India; alternate proposal for aluminum reduction and fabrication plant near Rihand Dam site, with manufacture of alumina only at Annapur; estimated production costs for both plans.
(A4, W10; Al)

470-A. On Certain Mines, Geological and Mining Institutions and Factories in Japan. B. C. Roy. *Geological, Mining and Metallurgical Society of India, Bulletin*, no. 18, Jan. 1957, p. 1-32.

Report of visits to Kamioka lead-zinc mines, Hitachi copper mine, geological and mining institutions of Tokyo University, government departments, miscellaneous plants; includes data on mineral reserves and production, mining operations, production figures for nonmetallic minerals, nonferrous metals, aluminum, iron, steel, machine tools and allied industries. (A11a, A4, B general)

471-A. Effect of Metal Finishing Wastes on Sewage Purification. A. E. J. Pettet. *Institute of Metal Finishing, Transactions*, v. 33, 1955-56, p. 36-63.

Chief dangers of attack on sewers are from unneutralized acidity or

from concentrations of neutral sulphates in excess of 1,000 ppm. SO_3. To avoid interference with treatment of sewage, chemical pretreatment of wastes is necessary, including neutralization, precipitation of metallic salts, reduction of chromic acid and removal of cyanides. 37 ref. (A8b, L17)

472-A. New Titanium Sheet and Bar Alloys. *Materials in Design Engineering,* v. 46, Sept. 1957, p. 157, 159. (CMA)

Two new titanium alloys with strength, formability and high-temperature creep resistance. Ti-16V-2.5Al is a sheet alloy which is soft and formable in the solution treated condition and can be age hardened to high strength with usable ductility. Ti-8Al-2Cb-1Ta has less than 0.2% total plastic creep at 800° F. under 50,000 psi. and after 300 hr. (A4, Q general; Ti)

473-A. Science for Electroplaters. Pt. 29. Cyanide Disposal Methods. L. Serota. *Metal Finishing,* v. 55, Oct. 1957, p. 75-77, 79.

Survey of complexing agents and compounds for the conversion of cyanide in wastes to less toxic substances. (A8b, L17)

474-A. Engineering Research at East Kilbridge. R. J. F. Franklin. *Metal Industry,* v. 91, Sept. 27, 1957, p. 265-269.

Research at the Mechanical Engineering Research Laboratory of the British Department of Scientific and Industrial Research includes investigation of fatigue cracks, fatigue strength, creep, plastic deformation, the design of extrusion dies and the mechanism of heat transfer. 6 ref. (A9h, Q general)

475-A. What's in the Literature? Frank T. Sisco. *Metal Progress,* v. 72, Oct. 1957, p. 122-124.

Searching of metallurgical literature is now so costly in time of high-grade men that it is frequently cheaper to get a direct answer by laboratory research than to find out whether someone else has recorded his findings. It is hoped that machine searching of metallurgical literature will correct this situation, at least in the field of metals engineering. (A14e)

476-A. Progress in Magnesium. H. G. Warrington. *Metal Progress,* v. 72, Oct. 1957, p. 139-142.

Unlimited ore supplies, well-developed reduction and fabrication processes, light weight and other inherent advantages together with continually improved alloys, foreshadow enlarged consumption for all sorts of machinery in motion, for nuclear reactors, and for consumer goods. (A general, 17-7; Mg)

477-A. SRI Metals Lab: Industry Research Partner. Robert T. Reinhardt. *Western Metals,* v. 15, Sept. 1957, p. 71-72.

The contract research program and facilities at Stanford Metallurgical Laboratory. (A9h)

478-A. The Zinc Industry in Australia. *Castings,* v. 3, Sept. 1957, p. 5-11.

Activities of the Electrolytic Zinc Co. of Australasia Ltd. (A general; Zn)

479-A. Lithium Climbs Out of Obscurity. G. G. Carr. *Iron Age,* v. 180, Oct. 10, 1957, p. 80-81.

Possible applications of lithium in alloying. (A general; Li, 17-7)

480-A. What Metalworking Looks for in 2000. *Iron Age,* v. 180, Oct. 24, 1957, p. 161-164.

Probable technical developments in steelmaking, machine tools, automobiles, pressing and forming, foundries and aluminum. (A general)

481-A. Zirconium, Hafnium and Vanadium. *Materials in Design Engineering,* v. 46, Sept. 1957, p. 111. (CMA)

Tabulated data for physical, mechanical, fabricating and corrosion resistant properties. Uses are noted as nuclear or AEC classified. Available forms. (A general; Zr, Hf, V)

482-A. Alloy Cast Irons Can Solve Tough Problems. *Materials in Design Engineering,* v. 46, Oct. 1957, p. 140-144.

Various grades of corrosion resistant, heat resistant and special purpose gray cast irons with high silicon, nickel, chromium and copper alloying elements. Typical applications of each. 16 ref. (A general; CI-q, 17-7)

483-A. Titanium. John L. Everhart. *Materials in Design Engineering,* v. 46, Oct. 1957, p. 149-168.

Manual covering all commercial and semicommercial alloys now in production. Composition and properties, working characteristics, sug-

gested heat treatments with current applications in aircraft, corrosion resistant equipment and electronics. 22 ref. (A general, 17-7; Ti)

484-A. Science for Electroplaters. Pt. 28. Treatment of Chromate Wastes. L. Serota. *Metal Finishing,* v. 55, Sept. 1957, p. 65-67, 71.

Treatment by reduction with barium sulphide, sodium bisulphite, ferrous sulphate, sulphur dioxide and chromate recovery by ion-exchange resins. (A8b, L17; Cr)

485-A. Vacuum Metallurgy. A. E. Williams. *Metal Industry,* v. 91, Sept. 20, 1957, p. 233-237.

High-vacuum processes for degassing, distillation, melting, metallizing, heat treating and powder metallurgy. Advantages of vacuum process for wide range of metal treatment. (A general, 1-23)

486-A. Rare Earth Metals; Their Properties and Industrial Application. *Metal Treatment and Drop Forging,* v. 24, Oct. 1957, p. 421-424.

Compounds of rare earths with sulphur; alloys of rare earths; metallurgical applications; rare earths as alloying agents; use in steelmaking; elimination of impurities in the mass of the steel; industrial applications of rare earths.
(A general; EG-g, AD-n, 17-7)

487-A. The British Iron and Steel Research Association. *Metallurgia,* v. 56, Oct. 1957, p. 169-174.

Current research in ironmaking, steelmaking, metalworking, coatings, plant engineering and operations research. (A9h; Fe, ST)

488-A. The British Welding Research Association. *Metallurgia,* v. 56, Oct. 1957, p. 175-178.

Work in structural designs, brittle fracture, fatigue, pressure vessels, storage tanks, pipelines, resistance welding and nondestructive testing.
(A9h, K general)

489-A. British Non-Ferrous Metals Research Association. E. C. Mantle. *Metallurgia,* v. 56, Oct. 1957, p. 179-182, 188.

Current activity includes a projected study of thorium as a fuel in nuclear power stations; X-ray fluorescence analysis; analysis with ion exchange resins and high-strength light alloys.
(A9h; EG-c38)

490-A. The British Cast Iron Research Association. G. R. Woodward. *Metallurgia,* v. 56, Oct. 1957, p. 183-188.

Investigations include soundness of castings, mechanical properties, graphite formation, thermal shock and mold soundness, corrosion, gases in cast iron and foundry sands.
(A9h, E general)

491-A. The British Steel Castings Research Association. A. H. Sully. *Metallurgia,* v. 56, Oct. 1957, p. 189-192.

Study of molding materials, steelmaking, foundry processes, properties of cast steel and the operation of foundry plant and equipment.
(A9h, E general; ST)

492-A. Indium in Industry. *Mining Journal,* v. 249, Sept. 20, 1957, p. 338-339.

History, occurrences, extraction, estimation, properties, uses.
(A general; In)

493-A. Grinding Wheels. G. Frank Loewy. *Modern Castings,* v. 32, Nov. 1957, p. 50-52.

Safety rules for grinding operations. (A7p, G18)

494-A. Trip to the Bureau of Mines, Albany, Ore., Regarding Rare Earth Alloy Development. C. F. Leitten, Jr. Oak Ridge National Laboratory. *U. S. Atomic Energy Commission,* CF-56-11-29, Nov. 5, 1956, 5 p. (CMA)

Discussions at a Bureau of Mines meeting on the development of lanthanon alloys. Steps for the refinement of lanthanons from their oxides, alloy preparation and fabrication. Gadolinium has so far been separated and alloyed with titanium, zirconium and stainless steels.
(A general, EG-g)

495-A. Welding Hazards: Our Modern-Day Mythology. T. B. Jefferson. *Welding Engineer,* v. 42, Oct. 1957, p. 39-41.

Facts about injurious metal fumes occasionally created during welding.
(A7, K general)

496-A. A New Look at High-Temperature Alloy Development. C. L. Hibert. *Western Machinery and Steel World,* v. 48, Sept. 1957, p. 119-122.

Suggests need for high-temperature alloys containing large amount of more abundant elements such as Si, Al, Fe, Mg or Ti.
(A general; SGA-h)

497-A. (German, French, Spanish, English.) **Abrasives in Metallurgy.** *Aciers Fins & Speciaux Francais,* no. 26, July 1957, p. 97-99.

Nature of abrasion phenomena and abrasives, their history and applications; aptitude of metal to abra-

sion and classification of uses of abrasives. (A general, NM-j)

498-A. (English.) **Production Problems of Titanium and Its Alloys. Pt. 2.** R. L. P. Berry and E. Swainson. *Tidsskrift for Kjemi, Bergvesen og Metallurgi,* v. 17, July 1957, p. 108-112. (CMA)

Furnace developments needed for the future, physical and chemical aspects of scrap reclamation and present reclamation procedures, heating precautions, hot and cold working, extrusion, annealing, metal and alloy sheet production, descaling, welding, brazing, machining, improvements in titanium processing and production statistics for 1948-1958 (projected). (A general; Ti)

499-A. (French.) **Super Alloys and Cermets.** Jean A. Ternisien. *Technique Moderne,* v. 49, Aug. 1957, p. 444-447.

Properties of cermets compared with those of superalloys; types of cermets and their manufacture. 10 ref. (A general; SGA-h, 6-20)

500-A. (German.) **Welds and Castings.** Jules Kisler. *Giesserei-Praxis,* v. 75, Aug. 25, 1957, p. 356-359.

Technical and economic comparison of welded versus cast construction; examples of typical applications. (A general; 7-1, 5, 17-7)

501-A. (German.) **Historic Cast Iron Pipes.** Adalbert Wittmoser. *Giesserei,* v. 44, Sept. 26, 1957, p. 557-563.

Last 500 years of cast iron pipe fabrication; results of the tests on the materials used. 13 ref. (A2; CI, 4-10)

502-A. (Italian.) **Safety Rules for Personnel Employed in the Production of Cast Iron.** *Fonderia,* v. 6, Aug. 1957, p. 361-369.

Rules of leading Italian manufacturer were worked out on basis of equipment and work cycle. Rules for blast furnace, loading, pig breaking, storing area, electric furnace, agglomeration operations. (A7p, D1, Fe)

503-A. (Italian.) **Production, Properties and Uses of Super Pure Aluminum.** Eugenio Hugony. *Rivista di Ingegneria,* v. 7, Aug. 1957, p. 897-908.

Electrolytic and mercury processes, special processes employing catalytic distillation of aluminum in presence of halides; comparison of properties of super pure (99.996%) and pure (99.5%) Al. Use in manufacture of special alloys such as "Reflectal 0.5" and "Reflectal 20," containing respectively 0.5% and 2% Mg, and "Reflectal 74" containing 0.75% Mg plus 0.45% Si. Use in electrolytic condensers, reflectors, jewelry, household equipment, construction (where it provides high corrosion resistance), chemical apparatus, electric cable coverings. 21 ref. (A general, 17-7; Al-a)

504-A. (Russian.) **Granulation of Manganese Slags.** D. S. Chikashua, A. I. Metreveli and O. I. Voitenko. *Stal',* v. 17, July 1957, p. 611-615.

Air and water-air granulation process for manganese slags. The water-air granulation process is recommended as certain materials otherwise considered a waste such as too fine grades of coke, lime and poor grade ore can be incorporated into the slag. 5 ref. (A11d; RM-q, Mn)

505-A. (Spanish.) **Experience With and Methods Used in Switzerland in Examining Welding Operators.** C. G. Keel. *Ciencia y Tecnica de la Soldadura,* v. 7, July-Aug. 1957, 8 p.

Examination consists of welding a plate in horizontal and vertical positions, plus 16 other supplementary tests, including oral. Between 1947 and 1956, 982 applicants were approved in Switzerland. Analysis of ages, trades of applicants, selection of tests, costs of examinations. (A6m, K general)

506-A. (English.) **General Principles Governing the Choice of Materials.** N. P. Allen. *Teknisk Ukeblad,* v. 104, Sept. 12, 1957, p. 735-742.

From point of view of metallurgist, who provides the material rather than the man who only uses it. Material must be able to meet four requirements: availability, ability to be put into required form, ability to do required technical job, sufficient permanency to do job for economically long period. (A general, 17-7)

507-A. (French.) **Improvements in Cermets and Recent Industrial Applications.** *Genie Civil,* v. 134, Sept. 15, 1957, p. 379-381.

Composition and properties of carbide, boride and aluminide-base cermets; physical properties of sintered alumina used in cutting tools; advantages of sintered alumina for cutting tools and special machining applications such as gears or transmission shafts for turbines. (A general, T6n, 17-7; 6-20)

508-A. (German.) **Strontium.** Fr. W. Landgraeber. *Chemiker Zeitung,* v. 81, Aug. 5, 1957, p. 498-501.

Use, physical and chemical properties, mining techniques and deposits. (A general; Sr)

509-A. (Book.) **Basic Metallurgy, v. 2.** G. William Zuspan. 232 p. 1957. American Society for Metals, 7301 Euclid Ave., Cleveland 3, Ohio. $7.50.

A laboratory text for use with volume 1 for the first two courses for beginning evening students. Metallurgical tests and heat treatment; typical headings are hardness testing, nondestructive testing, corrosion testing, heat treatment equipment. 7 ref. (A general, Q general, S general, R11, J general, 1-2)

510-A. (Book.) **Ductile Chromium.** 376 p., Aug. 1957. American Society for Metals, 7301 Euclid Ave., Cleveland 3, Ohio. $7.50.

Proceedings of the 1955 Conference co-sponsored by the Office of Ordnance Research, U. S. Army, and the American Society for Metals. Extraction, fabrication and properties; research findings. (A general; Cr)

511-A. (Book.) **Glossary of Terms in Nuclear Science and Technology.** National Research Council. 180 p. 1957. American Society of Mechanical Engineers, 29 W. 39th St., New York 18, N. Y. $5.00.

Designed to provide a common language among medical men, engineers, chemists, physicists, biologists and others working with the atom, it includes three categories of terms; those invented expressly for the field of nuclear energy, those borrowed from other fields and employed here with different meanings, and those used elsewhere but which may be unfamiliar to nuclear workers. Definitions, tables, charts and formulas. (A general, P18; 11-17)

512-A. (Book.) **Engineering Metallurgy.** Committee on Metallurgy. 516 p. 1957. Pitman Publishing Corp., 2 W. 45th St., New York 36, N. Y. $7.50.

Forty professors present the principles of ferrous and nonferrous metallurgy for engineers—student and practicing. General principles of metallurgy, phase diagrams, heat treatment, machinability, corrosion and temperature effects. (A general)

513-A. (Book.) **Dangerous Properties of Industrial Materials.** N. Irving Sax. 140 p. 1957. Reinhold Publishing Corp., 430 Park Ave., New York 22, N. Y. $22.50.

Revised and enlarged edition of "Handbook of Dangerous Materials". Safety reference for those involved in the manufacture, use, handling, storing or shipping of hazardous materials. Nuclear reactors and radiation are treated in separate chapters. (A7)

SECTION B

RAW MATERIALS and ORE PREPARATION

1-B. (Russian.) **Semicoking of Hard Fuels in an Active Gaseous Medium at High Pressure.** V. S. Al'tshuler and G. S. Shafir. *Khimiia i Tekhnologiia Topliva,* no. 10, Oct. 1956, p. 45-55.

Influence of a gaseous medium on the semicoking of hard fuels under pressure was tested. Esthonian schist and Ukrainian brown coal were used in a hydrogen and steam medium at pressures up to 100 atmospheres. (B17g; NM-q)

2-B. Reaction Zones in the Iron-Ore Sintering Process. R. D. Burlingame, Gust Bitsianes and T. L. Joseph. *Industrial Heating,* v. 23, Nov. 1956, p. 2375-2376, 2390.

To investigate changes that precede the formation of sinter, sintering zones were arrested after they progressed part way through the bed. When the sintering zone reached the half-way point, as indicated by the sudden increase in the hot junction temperature, the charge was quenched. (B16a; Fe)

3-B. Beneficiation Studies of Nickeliferous Ores From the Shamrock Mine, Jackson County, Ore., and the Congress Mine, Ferry County, Wash. J. E. Shelton. *U. S. Bureau of Mines, Report of Investigations* 5261, Oct. 1956, 8 p.

Bulk sulphide flotation to reduce the weight of product, before hydrometallurgical or pyrometallurgical treatment, offers the best method for utilizing the material.
(B14h; Fe, Ni)

4-B. Development of a Chloride Volatilization Process for Manganese Ores From Aroostook County, Me.: Progress Report. R. T. MacMillan and T. L. Turner. *U. S. Bureau of Mines, Report of Investigations* 5281, Oct. 1956, 31 p.

Manganese chloride volatilization with gaseous hydrochloric acid; conversion of chloridization product to oxide form; recovery of hydrochloric acid from hydrolysis step for recycling to chloridizing furnace; test on controlling manganese-iron ratio in product; solubility study.
(B15q; Mn)

5-B. A Mineral-Dressing Study of Manganese Deposits of West-Central Ark. M. M. Fine and D. W. Frommer. *U. S. Bureau of Mines, Report of Investigations* 5262, Oct. 1956, 21 p.

In most instances, a too-intimate association of manganese oxides and gangue is conducive to low grade, low recovery, or both, so that mechanical concentration processes do not promise much for this district.
(B14; Mn)

6-B. (Czech.) **Evaluating Coke for Blast Furnaces. III. A New Method of Evaluating Coke.** O. Havel and V. Rerabek. *Paliva,* v. 36, no. 10, Oct. 1956, p. 329-334.

Evaluates present methods and compares mechanical testing methods and their inadequacies. Suggests simple method of evaluation to determine firmness, quantity of fragmentation, fragmentation resistance, and over-all quality.
(B17, D1; NM-q 38)

7-B. (Russian.) **Nonfired Magnesite Chromium Brick.** G. G. Aristov and M. I. Panfilov. *Metallurg,* no. 10, Oct. 1956, p. 22-23.

The thermal dilatation of burnt magnesite chrome brick in open-hearth furnaces was compensated by the shrinkage of the nonfired bricks, and stress in the crown was relieved. (B19, D2; NM-h)

8-B. From Pit to Pellet. Reserve Mining Co., Taconite Project. *Engineering and Mining Journal,* v. 157, Dec. 1956, p. 78-79.

Flow sheet and step-by-step explanation. (B16b; Fe, 14-9)

9-B. Sintering Characteristics of a Cleveland Ironstone. P. K. Gledhill and C. Lang. *Iron and Steel Institute, Journal,* v. 184, Dec. 1956, p. 434-437.

Output of blast furnace sinter; degree of oxidation and percentage of sulphur removal. (B16a; Fe)

10-B. Over-All Zirconium Supply (Raw Materials). H. A. Sharpe. Paper from "Zirconium — Technology and Economics". Atomic Industrial Forum, p. 55-58. (CMA)

The mineral sources, occurrences and ore-recoveryy of zirconium reviewed. Operations of Humphries Gold Co. and Florida Ore Processing Co. on beach sand deposits and the equipment they use described. (B general, A11a; Zr)

11-B. (English.) **Fluidized-Bed Roasting of Pyrite.** Motoo Watanabe and Akiichi Kigoshi. *Science Reports of the Research Institutes, Tohoku University,* v. 8, Dec. 1956, p. 511-531.

Material, preliminary considerations of chemical reactions, apparatus and procedure; results given as tables. Discussions of results from the point of unit operations. (B13g; Fe, Cu, Co, 14-9)

12-B. (German.) **Methods of Modern Ore Dressing.** L. Frank. *Metall,* v. 11, Jan. 1957, p. 10-17.

Methods used in Germany with particular application to lead-zinc ores. Sorting, grinding, floating and sedimentation, chemical and combined processes described and illustrated. 10 ref. (B13, B14; Pb, Zn, 14-9)

13-B. Selecting Crushing—the Preparation of Iron Ores by Impact Crushers. E. Andreas. *Canadian Mining Journal,* v. 78, Jan. 1957, p. 56-59.

Description of the Hazemag impact crusher and reports on its use with siderite and limonite from German mines. (B13a; Fe, 14-9)

14-B. Marquette Starts Jasper Plant. *Engineering and Mining Journal,* v. 158, Jan. 1957, p. 76-79.

"Flying Saucer" and an updraft traveling grate for pelletizing are the innovations in new plant in Marquette Range. (B16b; Fe)

15-B. Extraction of Uranium From Gold Ore Residues. Peter Holz. *Indian and Eastern Engineer,* v. 119, Oct. 1956, p. 241-243.

Uranium production plants have been started in South Africa on a large scale. (B general, C general; U, Au)

16-B. Fluidized Solids Technique: Magnetic Conversion of Iron Ores. Robert J. Priestley. *Industrial and Engineering Chemistry,* v. 49, Jan. 1957, p. 62-64.

Design of profitable commercial plants; situations where this process is recommended. (B13g; Fe)

17-B. Laboratory Studies on the Beneficiation of Some Ferruginous Manganese Ores of India for Production of Ferromanganese. *Institution of Mining and Metallurgy, Bulletin,* no. 601, Dec. 1956, p. 49-68.

Equilibrium diagrams and reaction kinetics for production of ferromanganese. 23 ref. (B14; Mn, AD-n 31)

18-B. Centrifugal Concentrating Pans. *Mine and Quarry Engineering,* v. 23, Jan. 1957, p. 24-27.

Principle of operation, performance and applications of this type of mineral dressing equipment. (B14m, 1-2)

19-B. (Portuguese.) **Notes on Iron and Manganese Mines in Goa.** Abilino Vicente. *Técnica,* v. 31, Nov. 1956, p. 127-139.

Description of deposits; analysis of ores; history of mining operations since 1636. 6 ref. (B12, A11a; Fe, Mn)

20-B. Concentration of Tin Alluvial From Shaw River, W.A. K. Blaskitt. *Australian Scientific and Industrial Research Organization, Ore Dressing Investigations Report No. 521,* April 56, 8 p.

Recoverable tin in the sample is about 0.1%. More than half is finer than 25 mesh. (B14; Sn, 14-9)

21-B. Automatic Control of the Grinding Circuit at Marmora Concentrator. P. L. Steffensen and W. M. Aubrey. *Mining Engineering,* v. 9, Jan. 1957, p. 61-64.

Flow sheet and operating data of control system developed to maintain grinding analysis within narrow limits for ball mills in closed circuits with cyclones. Used at Marmora for concentrating treatment of magnetite ore. (B13c; Fe, RM-n)

22-B. Studies on the Beneficiation of Low Grade Ores by Flotation. N.

R. S. Srinivasan and H. S. Aswath. *Indian Institute of Science, Section B, Journal,* v. 38, July 1956, p. 135-142.

Separating quartz and gangue from beryl in low-grade beryl ores by froth flotation. The separation of quartz was attempted by (1) flotation of quartz at a pH of above 11 using oleic acid and terpinol, barium chloride as activation for quartz and alizarin red-sulphur as depressant for beryl, and (2) flotation of beryl at about pH 6 by using only oleic acid and terpineol. A concentrate of 11% beryllium oxide was made at 84% recovery. 20 ref. (B14h, Be, RM-n)

23-B. Uranium-Aluminum Alloy Dissolution. Some Basic Factors in Processing Spent Nuclear Fuel. R. G. Wymer and R. E. Blanco. *Industrial and Engineering Chemistry,* v. 49, Jan. 1957, p. 59-61.

Nitric acid-mercuric nitrate system, effect of mercury concentration, stoichiochemistry of the catalyzed dissolution, caustic system, effect of dissolvent impurities and dissolution of uranium solids. Process used to remove jackets from reactor core materials. (B23, T11g; U, Al)

24-B. (English.) **Studies on the Metallurgy of Antimonial Ores Bearing Gold and Silver.** Tatsuo Matsukawa and Tosiyuki Sakai. *Osaka University Technology Reports,* v. 6, Mar. 1956, p. 123-131.

The roasted residues from Herrenshmidt roaster, which contain gold and silver, are not amenable to ordinary cyaniding. If the roasted residues are roasted with 8 to 10% caustic soda, the extraction of gold increases to 97% and that of silver to 82%. 6 ref. (B15, C19pi; Au, Ag)

25-B. The Uranyl-Ammonium Phosphate Process for Recovery of Uranium From Slag Scrap. E. R. Johnson, E. O. Rutenkroger, A. B. Kreuzmann and B. C. Doums. *Chemical Engineering Progress,* v. 53, Feb. 1957, p. 56F-59F.

The phosphate precipitation process has been successful in recovering uranium from magnesium fluoride slag in yields in excess of 98%; equipment and process are described. 6 ref. (B23, C19; U, RM-q)

26-B. Uranium Recovery From Aqueous Wastes. R. J. Clouse, J. Dyksta and B. H. Thompson. *Chemical Engineering Progress,* v. 53, Feb. 1957, p. 65F-69F.

Solutions derived from equipment cleaning at the gaseous diffusion plant contain isotopically enriched uranium. The facility for recovering this uranium, processing it to an oxide, fluorinating the oxide to uranium hexafluoride is reviewed. (B23, C6b; U)

27-B. (German.) **Production and Application of Foamed Slag.** Walter Ruopp. *Stahl und Eisen,* v. 77, Jan. 10, 1957, p. 36-43.

Differences in various methods for the production of foamed slag. Review on the processes used thus far. Application as a lightweight insulation material and for concrete cast in site. (B23; RM-q)

28-B. (Book—German.) **Flotation.** A. W. Troizki. 215 p. 1956. Fachbuchverlag, Leipzig, Germany.

Survey of flotation and equipment used in flotation plants in the Soviet Union. Covers preparatory processes, ore dressing and production control. Translation from the Russian, originally published by Verlag Metallurgisdat, Moscow, 1948. (B14h)

29-B. Oxidized Copper. Part III. *Engineering and Mining Journal,* v. 158, March 1957, p. 80-84.

Problems of oxide flotation-smelting, oxide-leach-electrolysis, and oxide - leach - cementation, discussed from the viewpoints of recovery and cost estimation. (B14h, C19n; Cu)

30-B. How to Use This Modified Hallimond Tube—for Better Flotation Testing. D. W. Fuerstenau, G. D. Steel and P. H. Metzger. *Engineering and Mining Journal,* v. 158, March 1957, p. 93-95.

An improved laboratory flotation cell that gives reproducible results on 2-g. or 3-g. samples of 65 to 100-mesh feed has been developed by modifying the Hallimond tube. (B14h, 1-3)

31-B. (English.) **Fluidized-Bed Roasting of Pyrite.** Motoo Watanabe and Akiichi Kigoshi. *Tohoku University, Science Reports of the Research Institutes,* v. 8A, Dec. 1956, p. 512-531.

The problem of thorough utilization of domestic pyrite, which contains a small amount of cobalt, copper and zinc, the sulphatizing roasting process, which is based upon the preferential sulphatization by fluidized-bed reactor, was studied. (B15q; Fe, *Co, Cu,* Zn)

32-B. Differential High-Temperature Sulfatization of Cuyuna Manganese Ore. Charles Prasky. *Journal of Met-*

als, v. 9, Mar. 1957, *AIME Transactions,* v. 209, p. 377-380.

Progress report describes methods for concentrating low-grade manganese ore developed to pilot plant scale; process involves sulfur dioxide air roast followed by watered leach and recovery by evaporation and thermo decomposition of manganese oxide. (B15, C19n; Mn)

33-B. Importance of the Spinel Phase in the Steel Industry: Pt. 1. E. F. Osborn. *Industrial Heaating,* v. 24, Mar. 1957, p. 575-578.

Chemical and crystallographic aspects of spinels in refractories; phase relationships in systems of magnesia, iron oxide, silica at high and low oxygen pressures. (To be continued.) (B19; ST)

34-B. Flotation. *Industry and Engineering Chemistry,* v. 49, Mar. 1957, p. 493-696.

Literature review; particle-bubble adhesion, surface chemistry, electro kinetics and application of radioisotopes in research are emphasized. 51 ref. (B14h)

35-B. Roasting Reaction of Ferrous Sulfide. Kichizo Niwa, Tsuguyasu Wada and Yutaka Shiraishi. *Journal of Metals,* v. 9, Feb. 1957, p. 269-273.

Rate and mechanism of oxidation of ferrous sulphide studied by means of the spring balance and X-ray diffraction over the range of 500 to 700° C. Deficiency of iron ion occurs in initial stage of oxidation. Complete oxidation to oxides begins at 600° C. Above 600° C. rate of oxidation does not change with temperature, so rate-determining factor is diffusion of gas. 9 ref. (B15; Fe)

36-B. Extraction of Tungsten From High Speed Steel Grinding Swart and Scale. F. H. Scott. *Metallurgia,* v. 55, Mar. 1957, p. 140-142.

Process for recovery of 80 to 90% of tungsten in grinding swarf or scale depends on oxidation of material and simultaneous fusion with sodium carbonate followed by precipitation with calcium chloride. Process economically feasible on pilot-plant scale. (B23; W)

37-B. High Voltage and Magnetic Separation. J. Hall Carpenter. *Mining Congress Journal,* v. 43, Mar. 1957, p. 62-65.

High voltage and magnetic separation methods in the ore dressing field; description of apparatus and its applications. (B14j; 1-2)

38-B. Filtration and Control of Moisture Content on Taconite Concentrates. A. F. Henderson, C. F. Cornell, A. F. Dunyon and D. A. Dahlstrom. *Mining Engineering,* v. 9, Mar. 1957, p. 349-354.

Study of filtration of the concentrate slurry prior to balling and hardening of pellets. Effect of drying time, filtration rate, cake thickness, vacuum level, feed temperatures, pulp grind size, pulp density and filter medium on the cake's moisture content. (B14q; Fe, RM-n)

39-B. Cominco's New Sinter Plant. E. A. Mitchell, J. F. Melvin and R. Bainbridge. *Journal of Metals,* v. 9, *AIME Transactions,* v. 209, Mar. 1957, p. 361-370.

Design and operation of plant for sintering material for lead smelter. High proportion of zinc plant residue requires specialized techniques; mixing, drying, sintering and sinter crushing operations.
(B16a, 1-2; Pb, Zn)

40-B. Selenium and Tellurium Recovery From Canadian Ores. L. E. Djingheuzian. *Mining Journal,* v. 248, Feb. 15, 1957, p. 210-211.

Selenium and tellurium occur as copper selenides and copper-gold tellurides in the copper-nickel ore. Both metals are present in exceedingly small quantities. Procedure for extraction and refining is described. (B general, C general; Se, Te, RM-n)

41-B. How Otanmaki Floats Ilmenite From Finland's Titaniferous-Magnetite. U. Runolinna. *Mining World,* v. 19, Apr. 1957, p. 49-55, 96. (CMA)

The government-owned Otanmaki Co. of Finland is now Europe's largest vanadium producer; ilmenite is also produced. Ore concentration is discussed. The ore is crushed in open circuit in three stages and wet-cobbed in the concentrator before grinding. The magnetic fraction is ground, the magnetite is separated magnetically and the pyrite and ilmenite are floated in respective stages. The requisites for the crushing plant are enumerated. Flotation cells and other units are described. Flow sheets are shown.
(B13, B14; Ti, V)

42-B. Salt Roast, Hot Water Leach, and H_2SO_4 Precipitation Recover V_2O_5. M. Merenmies. *Mining World,* v. 19, Apr. 1957, p. 55. (CMA)

Otanmaki magnetite averages 0.5% vanadium. The latter is re-

covered by mixing the magnetite concentrate with salt, ball milling, and pelletizing the pulp. Small balls of pulp are fed into pelletizing furnace, and the burnt pellets are removed into a counter-current leaching system using hot water. The leachate is treated with H_2SO_4 to precipitate vanadic acid. The precipitate is then purified, fused and cast into flakes. Production began July 1956. (B16b, C19n; V)

43-B. Some Technological Implications of Fundamental Research. W. F. Ford. *Refractories Journal,* Feb. 1957, p. 76-80, 87.

Refractory studies, phase equilibrium diagrams, silica brick quality, steel ladle linings, chromium-magnesite bricks and magnesite bricks. (B19; RM-h)

44-B. Radioactive Tracer Investigations in a Flotation Circuit. G. G. Eichholz, W. B. Muir, M. J. S. Bennett, J. D. Wild, C. Lawton and S. Mostowy. *Canadian Mining and Metallurgical Bulletin,* v. 50, Mar. 1957, p. 121-127. (*Transactions,* v. 60, 1957, p. 63-69.)

Experiments carried out with copper sulphate formed with copper-64 and radioactive zinc ore in actual mill circuit to estimate effectiveness of tracer method in establishing contact times; particle distribution and recirculation; results recorded on adding copper sulphate tracer to zinc flotation circuit and radioactive zinc ore to normal mill feed. (B14h, 1-4; Zn, RM-n)

45-B. Development of Tungsten Ore Dressing Practice. H. H. Kipp. *Canadian Mining and Metallurgical Bulletin,* v. 50, Mar. 1957, p. 134-136. (*Transactions,* v. 60, 1957, p. 76-78.)

Description and flow diagram of processes used in treatment of scheelite by gravity concentration and scheelite flotation showing change of the role of flotation. (B14h; W, RM-n)

46-B. Tungsten Milling and Current Metallurgy at Canadian Exploration Limited. R. J. McLeod. *Canadian Mining and Metallurgical Bulletin,* v. 50, Mar. 1957, p. 137-142. (*Transactions,* v. 60, 1957, p. 79-84.)

Equipment and processes used in milling, sulphide flotation, tabling, thickening, scheelite flotation, leaching, drying and blending of tungsten ore. (B13, B14; W, RM-n)

47-B. Flotation of Iron Sulfides From Zinc Tailings of Southwestern Wisconsin Lead-Zinc District. T. A. Evans, J. W. Pennigton and R. A. Wasson. *U.S. Bureau of Mines,* Report of Investigation 5324, Mar. 1957, 9 p.

Investigation of the flotation of iron sulphides from zinc-lead mill tailings. The sulphur content of the iron sulphide concentrates produced ranged between 39.87 and 47.23%, representing recoveries of 73.8 to 84.9% of the total sulphur. (B14h; Fe, Zn, Pb)

48-B. Dehydration of Bauxites of Different Origins. V. N. Krylov and A. S. Polubilova. *Journal of Applied Chemistry of the USSR,* v. 29, May 1956, p. 759-764. (Translated by Consultants Bureau, Inc., 227 W. 17th St., New York 11, N.Y.)

Dehydration of bauxites begins in the range 220-470° C., and depends on the nature of the bauxite and its grain size. The temperature ranges in which most of the crystallization water is removed have been determined for bauxites of different origins and grain sizes. Bauxites heated below the temperature of total dehydration have considerable degree of hygroscopicity, which depends on the ignition temperature and humidification condition. (B14p; Al, RM-n)

49-B. New Horizons for Lithium. P. E. Landolt. *Mining Engineering,* v. 9, Apr. 1957, p. 460-464.

Lithium ore deposits in United States; methods of mining and recovery processes. 10 ref. (B general, A11a; Li)

50-B. Fuel for Sinter Plants. V. S. Pisarev. *Henry Brutcher Translation* no. 3882, 2 p. (From *Stal',* v. 16, no. 7, 1956, p. 585-586.) Henry Brutcher, Altadena, Calif.

Comparative experiments on the use of nut-size anthracite and anthracite fines, as against coke breeze (minus ⅜ and minus 1 in.) as fuels for sinter plants. Numerical data on fuel consumption, strength and lump size of sinter, and the specific output of the plant. Merits of inexpensive anthracite fines as sinter-plant fuel. (B16a; Fe, RM-j)

51-B. Application of Solvent Extraction in Climax Uranium Company's Plant. Ralph C. Toerper. *Mines Magazine,* v. 47, Mar. 1957, p. 89-90.

Economical approach to uranium extraction through the application of solvent extraction, a process which will become increasingly more important. (B14; U)

52-B. Today's Era of New Metals and Processes Makes Float-Hydro-Pyro-Chem Metallurgy. *Mining World,* v. 19, Apr. 15, 1957, p. 34-38.

Review on crushing and grinding, sizing and classification, flotation and ultrasonic methods in the field of extraction and refining.
(B13, B14)

53-B. Recovery of Tin and Tungsten From Tin-Smelter Slags. H. Kenworthy, A. G. Starliper and L. L. Freeman. *U.S. Bureau of Mines, Report of Investigations* 5327, Mar. 1957, 12 p.

Methods that proved effective were fusion reduction, chloride volatilization, sulphide volatilization and carbide formation. (B23; Sn, W, RM-q)

54-B. Strawberry Tungsten Battles Snow, Purchases and Geology. *Mining World,* v. 19, Apr. 15, 1957, p. 40-43.

Mining, milling and flotation methods for tungsten.
(B12, B13, B14h; W)

55-B. New Iron Mills Use Flotation; Research for Reduction Roasting to Magnetite. Stephen E. Erickson. *Mining World,* v. 19, Apr. 15, 1957, p. 47-51.

Concentration of magnetic and nonmagnetic taconite.
(B14h, B15p; Fe)

56-B. Note on a Process for the Extraction of the Rutile Form of Titania From Ilmenite. A. J. Caskin. *Queensland Government Mining Journal,* v. 58, Jan. 20, 1957, p. 21. (CMA)

Ilmenite may be converted to high-grade rutile by mixing the sand with 20% pyrite and 10% coke, heating in a kiln at 650-900° C. until the reaction is complete, cooling the sintered matter and breaking down with air and water under pressure at 120° C. The sulphur is returned to the pyrite feed and the rutile granules are washed from the iron oxide sludge. Quartz and other contaminants may be removed by conventional ore-dressing methods. TiO_2 recovery is about 90%. (B15r; Ti)

57-B. Concentration Tests on the Gold Uranium Ores of the Witwatersrand for the Recovery of Uranium. J. Levin. *South African Institute of Mining and Metallurgy, Journal,* v. 57, Nov. 1956, p. 209-254.

From most ores 20-30% of the uranium can be recovered by floating the thucholite with a frother only. Subsequent flotation with xanthate increases the uranium recovery by completing the flotation of the thucholite and floating some uraninite; prior cyanidation of the ore is detrimental. An additional recovery of low-grade concentrate can be made by Aerofloat reagents of sulphonates. Maximum recovery of uranium, 70-80% in about 20% weight of concentrate, can be obtained by flotation with oleic acid. 18 ref. (B14h; Au, U)

58-B. (German.) **Importance of the Preparation of Home Ores for the West German Iron Industry.** Erich Böhne. *Stahl und Eisen,* v. 77, May 2, 1957, p. 549-552.

Composition of German iron ore; survey of different methods of preparation and concentration; correlations between concentration and yield. (B general; Fe, RM-n)

59-B. Rheological Properties of Water Suspensions of Finely Subdivided Magnetite, Galena and Ferrosilicon. G. W. Govier, C. A. Shook and E. O. Lilge. *Canadian Mining and Metallurgical Bulletin,* v. 50, May 1957, p. 261-268.

Settling rate measurements indicate relative stability of the suspensions. Measurements of consistency were made with a Fann Model 35 rotational viscometer. Abnormal or non-Newtonian behavior was observed in the case of each medium, the apparent viscosity being dependent upon the rate of shear or the intensity of motion.
(B14; Fe, Pb, Si, AD-n)

60-B. Blast Furnace Coke Tested at High Temperature. Michael O. Holowaty and Charles M. Squarcy. *Journal of Metals,* v. 9, Apr. 1957, p. 577-581.

Description and procedure for high-temperature compression test designed to predict coke performance and correlation of test with performance in blast furnace. 6 ref.
(B18n, D1; RM-j43)

61-B. Zinc Industry in Australia. *Australasian Manufacturer,* v. 42, Apr. 6, 1957, p. 58-60, 65.

Brief survey of mining, milling, roasting, leaching, electrolysis, melting and casting operations currently employed.
(B general, C general; Zn)

62-B. Ore Dressing Developments in Australia, 1956. Pt. 1. Crushing,

Grinding, Gravity, Concentration, Flotation. H. H. Dunkin. *Chemical Engineering and Mining Reviews,* v. 49, Mar. 15, 1957, p. 177-181.

Survey of ore production, exploration and new equipment. (B14)

63-B. How Gorno Recovers Oxidized Zinc. Marcello Bill. *Engineering and Mining Journal,* v. 158, Apr. 1957, p. 82-86.

Zinc ore dressing techniques, new flotation reagents and refining procedures. (B14; Zn)

64-B. How to Process Alluvial Sand for Tantalum-Columbium. J. E. Shelton and W. A. Stickney. *Engineering and Mining Journal,* v. 158, Apr. 1957, p. 93-95.

A combination of gravity, magnetic and high-tension electrostatic separation is a potential means of producing a tantalum-columbium concentrate from alluvial sand. (B14; Ta, Cb)

65-B. Importance of Magnesium to the Scrap Trade. David Edelstein. *Waste Trade Journal,* v. 103, May 11, 1957, p. 36-37, 49.

Problem of contaminants in magnesium scrap; copper, aluminum, iron and nonmetallic materials. Tests for distinguishing between aluminum and magnesium; safe practice in handling and shipping. (B23; Mg, RM-p)

66-B. (German.) **Production of Finest Ore Agglomerates and Their Behavior in the Blast Furnace.** Ludwig von Bogdandy and Rudolf Schmolke. *Stahl und Eisen,* v. 77, May 30, 1957, p. 685-693.

Permeability to gas of the sintering mixture when sintering ore fines; improvement of the permeability to gas by submitting the raw mixture to a pelletizing process; "hard foam" process of the Hüttenwerk Oberhausen A.G.; saving in fuel and increase of production; briquetting trials with ore fines; verification of the behavior of briquettes and "hard foam" sinter in the blast furnace by means of radioactive isotopes. (B16, D1; Fe)

67-B. (German.) **Sinter Cooling—an Essential Element of Modern Sintering Plants.** Günther Brandes and Helmut Wendeborn. *Stahl und Eisen,* v. 77, May 30, 1957, p. 693-701.

Sinter cooling by water sprays, by passing the sintered product through a store yard or through a cooling bin; cooling by air suction; operational results of an experimental cooler; cooling curve of sinter; development of the straight cooling band and of the circular cooler; experiences gathered in practical operation. (B16a, 1-2; Fe)

68-B. H-Iron Process. A. M. Squires and C. A. Johnson. *Journal of Metals,* v. 9, Apr. 1957, p. 586-590.

Principle of process and operation of demonstration scale plant for the direct reduction of finely ground iron ore with hydrogen. Uses fluidized bed at about 1000° F. and with pressure in the range of 250 psi. (B15q; Fe)

69-B. Mineralogical Approach to the Development of the Uranium Extraction Processes Practiced on the the Witwatersrand. W. R. Libenberg. *South African Institute of Mining and Metallurgy, Journal,* v. 57, Nov. 1956, p. 153-208.

Chemical and microscopic results show the distribution of the uraniferous constituents throughout some of the products obtained by gravity, flotation and electromagnetic treatments of the crushed conglomerate and leach residues. 12 ref. (B14; U, RM-n)

70-B. (French.) **Physical Chemistry of Iron Ore Concentration.** A. Roos. *Le Génie Civil,* v. 134, Mar. 15, 1957, p. 129-133.

Theory of concentration; physical phenomena and chemical reactions; role of slag; crystallographic study of the concentrate; concentration practice. (B general; Fe, RM-n)

71-B. Refractories. D. M. Humby. *Castings,* v. 3, Mar. 1957, p. 22-33.

Note on historical development and types of manufactured refractories giving characteristics and application in metal industry. Discusses alumina, silica, basic, special purpose, insulating, plastic and castable refractories. (B19; RM-h)

72-B. Preparation of Scrap for Open Hearth Furnaces. Vernon W. Jones. *Iron and Steel Engineer,* v. 34, May 1957, p. 104-108.

Proper scrap preparation important for decreasing openhearth furnace charging time; shearing, bundling, bailing and transporting operation in a scrap yard. (B23, D2, W12, 1-2; ST, RM-p)

73-B. Flotation of Uranium and Pyrite at Vogelstruisbult Gold Mining Areas Ltd. F. O. Read, E. H. D. Carman and C. L. M. Gough. *South African Institute of Mining and Metal-*

lurgy, Journal, v. 57, Feb. 1957, p. 419-458.

A flotation process, treating slime reclaimed from the old slime-dam and current Main-reef slime after cyanidation for gold extraction, produces a concentrate weighing 6%, with a recovery of 40% U_3O_8 and 90% sulphur. (B14h; Au, U)

74-B. Final Treatment and Evaluation of Uranium Concentrates. M. G. Atmore. *South African Institute of Mining and Metallurgy, Journal,* v. 57, no. 8, Mar. 1957, p. 535-543.

Precipitated ammonium diuranate is stored in a slurry. Outlines collection and weighing, slurry sampling, slurry filtration, extruding and drying, sampling and packing, calcined sample preparation and analysis. (B14; U)

75-B. Laboratory Control of the Uranium, Acid and Flotation Plants at the Virginia O. F. S. Gold Mining Co. Ltd. L. B. Richards. *South African Institute of Mining and Metallurgy, Journal,* v. 27, no. 8, Mar. 1957, p. 544-564.

Laboratory design, equipment, personnel, safety, planning the analytical control program, sampling and preparation, routing samples in the laboratory, process control of plants, methods of analysis, research and development. (B14a, A9; U)

76-B. History of Tin Mining. Pt. 2. Tin Mining in Early Times. *Tin,* May 1957. p. 110-112.

Early mining methods employed by the Phoenicians, Romans, Normans and English in the Cornish tin mines 1200 to 1700 A.D.; mining history in other parts of the world. (To be continued.) (B12, A2; Sn)

77-B. (French.) **2nd Symposium on the Agglomeration of Iron Ores.** *Metallurgie et al Construction Mecanique,* v. 89, June 1957, p. 527-537.

Summary of the papers submitted at the Symposium organized by the Institut de Recherches de la Sidérurgie (I.R.S.I.D.): mechanism of agglomeration on grates, heat transfer, elimination of sulphur and other impurities, physical properties of agglomerates, influence of various additions. Agglomeration processes; reports on tests made in France and England. (To be continued.) (B14m; Fe, RM-n)

78-B. (German.) **Ore Dressing of Metals of Special Importance to Nuclear Engineering.** Helmut Kirchberg. *Neue Hütte,* v. 2, Feb-Mar. 1957, p. 77-84.

Dressing of minerals containing uranium, thorium, lithium, zirconium, titanium and beryllium deposits, and bismuth and cobalt ores. 27 ref. (B14; U, Th, Li, Zr, Ti, Be, Bi, Co, RM-n)

79-B. (German.) **Investigations in Lead Volatility in Roasting Zinc Ores.** Heinz Jahn and Helmut Winterhager. *Zeitschrift für Erzbergbau und Metallhüttenwesen,* v. 10, May, 1957, p. 226-234.

Sinter experiments with a number of variables; influence of additives; annealing in preparation for the use of the multiple-story furnace; various lead compounds in the processes; a combination of processes resulting in lead removal of over 70%. 17 ref. (B15; Zn, *Pb*)

80-B. (Japanese.) **Study on Titanium Compounds in Red Mud.** N. Sugiyama. *Light Metals (Tokyo),* v. 7, May 1957, p. 26-31. (CMA)

Various titanium oxides from the red mud of the Bayer alumina process were studied to determine the form they take. When TiO_2 is treated with caustic soda, the precipitate corresponds to $Na_2O.6TiO_2.7H20$; less Na_2O is combined if Fe_2O_3 is present. The titanium in high-titanium bauxite of India exists mainly as uncombined TiO_2, but treatment at low pressure with less concentrated alkaline solution causes the formation of a compound containing Na_2O. The more vigorous the treatment the more Na_2O is combined, up to $6Na_2O.TiO_2.7H_2O$. (B14; Al, *Ti*)

81-B. (Japanese.) **Sodium Compounds in Bayer Alumina Process.** Shigetoshi Mori, Eiichi Ishikawa and Shigeru Seimiya. *Light Metals,* v. 7, May 1957, p. 32-36.

Determination of the structure of sodium-aluminum silicate present in red mud during the Bayer alumina process. The compound, precipitated by means of the reaction between sodium aluminate and sodium silicate, was examined by chemical analysis and X-ray diffraction. Analysis of findings. 7 ref. (B14; Al)

82-B. (Polish.) **Arsenic Removal From Iron Ores by Sintering Process.** Eugeniusz Mazanek and Ryszard Benesch. *Hutnik,* v. 24, Feb. 1957, p. 45-47.

Survey of arsenic removal methods; description of experiments with arsenic removal by sintering; addi-

tion of sodium chloride was found to be beneficial.
(B16a; Fe, RM-n, *As*)

83-B. (Swedish.) **Method for Direct Reduction of Iron Ore Concentrate by Carbon Monoxide Without Melting.** Otto Stelling and Ivan Pereswetoff-Morath. *Jernkontorets Annaler,* v. 141, no. 5, 1957, p. 237-260.

When iron oxides in a fluidized bed are reduced by carbon monoxide at high temperatures, the process is retarded by the fact that the grains adhere to each other when a certain content of metallic iron is attained. However, if the reduction is accomplished under suitable conditions in a fluidized bed at a lower temperature (about 600° C.), cementite is formed instead of metallic iron, and no tendency to adhesion can be observed. Under the conditions used the formation of cementite is so rapid that the carbon monoxide does not decompose into carbon and carbon dioxide. Reaction velocities have been determined for different hematite ores as well as oxidized and non-oxidized magnetites. A technical process has been worked out based on the experimental results obtained and has been studied on a pilot plant scale. 6 ref. (B15q; Fe, RM-n)

84-B. Material Handling in the Sinter Process. Martin Vander Laan. *Blast Furnace and Steel Plant,* v. 45, July 1957, p. 727-730.

Flow chart from receipt of raw material to delivery into the blast furnace. (B16a, A5b; Fe, RM-n)

85-B. Importance of the Spinel Phase in the Steel Industry. Pt. 3. E. F. Osborn. *Industrial Heating,* v. 24, June 1957, p. 1215-1220.

Section on spinel phases in fireclay refractories shows phase equilibria relations for alumina, iron oxide, silica system at different oxygen pressures; spinel phases and transformations in iron ore covering maghemite and magnetite; advantages of ferromagnetic spinel structure in beneficiation process. 10 ref. (B14, B19; ST, RM-h)

86-B. (German.) **Use of "Komplexon" in Ore Analysis.** Heinz Grundlach. *Zeitschrift für Erzbergbau und Metallhüttenwesen,* v. 10, Apr. 1957, p. 177-182.

Methods for determining chief constituents in carboniferous and sulphide ores with particular reference to the use of the disodium salt of ethylene-diamine-tetra-acetic acid, known in the trade as Komplexon, Titriplex or Idranal. 7 ref.
(B11, S11; RM-n)

87-B. How A. S. & R. Raised Molybdenite Recovery on Copper Concentrate. *Engineering and Mining Journal,* v. 158, Aug. 1957, p. 104-106. (CMA)

American Smelting and Refining has improved over-all metal recovery at Silver Bell, Ariz., by installing a Morenci-process molybdenite recovery plant. The low-grade copper sulphide ore contains a small amount of molybdenum; the recleaner flotation concentrate contains 0.3-0.8% Mo. The Morenci process consists of several flotation steps without intermediate roasting.
(B14h; Cu, Mo)

88-B. Importance of Stainless Scrap Segregation. T. J. Wayne. *Waste Trade Journal,* June 8, 1957, p. 42-44.

Some results of laxity and effects of undesirable inclusions on surface quality of stainless stress the need for better identification and segregation. Suggestions for scrap preparation.
(B23, S10; SS, RM-p)

89-B. New Trends in the Design of Sinter Plants. A. B. Patkovskii. *Stal',* v. 15, no. 3, 1955, p. 208-215. *(Henry Brutcher Translation* no. 3836.)

Suggested improved flowsheet for sinter plants; improved individual operations such as methods of metering, transporting and screening of sinter; blending and mixing of charge components.
(B16, 1-2; ST, RM-n)

90-B. Reduction Experiments on Steep-Rock Ore. J. O. Edstrom. *Jernkontorets Annaler,* v. 140, no. 2, 1956, p. 130-136. *(Henry Brutcher Translation* no. 3842.)

Micrographic, X-ray and chemical analyses of Steep-Rock ore from Canada; main components; mineralogic make-up compared with rich, coarsely crystalline hematites. Absence of volume changes at end of reduction experiments.
(B general; Fe, RM-n)

91-B. (Polish.) **Self-Fluxing Agglomerate.** Eugeniusz Nazanek and Ryszard Benesch. *Hutnik,* v. 24, May 1957, p. 181-186.

Considerable improvement in blast furnace efficiency is achieved by the

use of self-fluxing agglomerate when poor grade ores are used. The agglomerate is made of a mixture of ore and limestone. 6 ref.
(B14m, Fe, RM-n)

92-B. (Russian.) **Intensification of Iron Ore Sintering.** A. E. Lebedev. *Metallurg,* v. 2, May 1957, p. 10.

Laboratory experiments whereby around 20% increase of gas permeability and process efficiency both for regular and fluxed sinter is obtained. The essential step is to premix and humidify the ore 5 min. before addition of the coke and then mix for 3 min.
(B16a; Fe, RM-n)

93-B. (Russian.) **Modern Techniques at the Sintering Plant of the Cherepovetsk Works.** N. M. Yakutsiner and L. P. Migutskii. *Stal',* v. 17, Apr. 1957, p. 293-300.

Results at the Cherepovetsk iron and steel works are given, confirming the use of high-capacity sintering machines to produce high-grade sinter of high basicity from the finely ground concentrates with siliceous gangue when the limestone admixed to the sintering burden is crushed sufficiently fine. (B16a; Fe, RM-n)

94-B. Canadian Iron and Steel Boosted by New Inventions. *Canadian Metalworking,* v. 20, July 1957, p. 30-32.

New type of mill and dry magnetic concentrator together with jet smelters may provide increasing production of iron from Canadian ores.
(B13, B14; Fe, RM-n)

95-B. North Rankin Nickel Mines. *Canadian Mining Journal,* v. 78, Aug. 1957, p. 93-97.

History, geology, minerology, equipment, mining methods and milling. (B12, B13; Ni, RM-n)

96-B. Bicroft Uranium Mines. *Canadian Mining Journal,* v. 78, Aug. 1957, p. 104-107.

Ore is in radioactive pegmatite dykes; mining is by shrinkage methods; milling employs acid leach, counter current decantation and ion exchange.
(B12, B13, A11a; U, RM-n)

97-B. Emulsion Flotation. A. W. Fahrenwald. *Mining Congress Journal,* v. 43, Aug. 1957, p. 72-74.

Process employs reagents, soap and oil in emulsion form. Theory and advantages vs. froth flotation for manganese. (B14h; Mn)

98-B. (French.) **Application of Statistical Methods to the Study of Certain Problems Encountered in the Ore Treatment Industry. Pt. 3. Progressive Method of Comparison of Two Experimental Methods.** P. Gy. *Annales des Mines,* Feb. 1957, p. 99-103.

To compare two different methods of flotation several tests are necessary; attempts to define adequate statistical sampling procedures. (B11, B14h, S12h; RM-n)

99-B. (German.) **Recovery of Rare Earths From Cola Phosphate.** Miroslav Ruprych. *Chemische Technik,* v. 9, June 1957, p. 353-354. (CMA)

Although the rare earth content of "cola concentrate" is not high (between 0.8 and 4.9%, averaging in 12 samples about 1.6%), it may lead to about 25 tons per year of rare earths in an average plant. Present methods are as yet economically inefficient, but the use of ion exchangers may improve efficient recovery. The main constituents of the rare earths in "cola concentrate" were identified as cerium, lanthanum, praseodymium, neodymium and samarium. 12 ref.
(B14; EG-g, RM-n)

100-B. (German.) **Turbulence Flocked Bed Roasting of Freiberg Zinc Blendes and Pyrites.** Ernst Theurich. *Neue Hütte,* v. 2, Feb-Mar. 1957, p. 191-199.

Increased importance of method due to shorter reaction time and lower investment; roasting of Freiberg zinc blende and arsenical Freiberg pyrites on an experimental basis; volatilization of arsenic, lead, cadmium during roasting; leachability of roasted zinc blende. 4 ref.
(B15; Zn, RM-n)

101-B. (Spanish.) **Hot Softening Behavior Under Load of Different Types of Refractories.** Eugenio Perez Blanco. *Instituto del Hierro y del Acero,* v. 10, Apr-June, 1957, p. 147-159.

Review of DIN, ASTM, British Standard and European test norms; causes of softening; characteristics and behavior of 10 refractory materials. 17 ref. (B19; RM-h)

102-B. New Taconite Process. *Chemical and Engineering News,* v. 35, Sept. 16, 1957, p. 72-73.

Fuel economy and hardest pellets yet feature Allis-Chalmers' pilot plant operation. (B16b; Fe)

103-B. Symposium on Cyclones. R. H. Lowe and F. D. DeVaney, Chairmen. *Mining Engineering,* v. 9, Aug. 1957, p. 869-889.

Presented under the auspices of the Mineral Beneficiation Division at the 1957 meeting to present a picture of one of the developments in beneficiation. Papers abstracted separately. (B13, W15p, 1-2)

104-B. Compilation of Cyclone Operating Data. T. M. Morris. Paper from "Symposium on Cyclones." *Mining Engineering,* v. 9, Aug. 1957, p. 877-879.

Data compiled from information submitted by 24 plants using cyclones for wet classification; ore treated, dimensions and operating data of cyclone and screen analysis of product. (B14e)

105-B. Use of Cyclones in the Grinding of Taconite. Fred D. DeVaney. Paper from "Symposium on Cyclones." *Mining Engineering,* v. 9, Aug. 1957, p. 880-882.

Use of cyclone classifiers in grinding circuit of taconite plant; data on cyclone operation, dimension, and screen analysis of product. (B14e; Fe)

106-B. Cyclone Practice in Arizona. Russell Salter and Edwin J. King. Paper from "Symposium on Cyclones." *Mining Engineering,* v. 9, Aug. 1957, p. 883-889.

Design and flow data and screen sizing of products for cyclone classifiers, primary grinding circuit, secondary grinding circuit, open circuit desliming ahead of regrind circuit in mills of seven Arizona companies. (B13e, B13f)

107-B. Hobart Produces Rutile. *Steel,* v. 141, Sept. 2, 1957, p. 97. (CMA)

Hobart Bros. (Troy, Ohio) produces rutile ilmenite, zircon + monazite from Florida beach sands with a constant flow separator at its Winter Beach, Fla. site. (B12, B14; Ti)

108-B. (French.) **Pelletization of Iron Ores.** *Technique Moderne,* v. 49, June 1957, p. 263-264.

Factors influencing location of pelletizing installations compared with those for calcination; features of pelletizing process; influence of pellet on blast furnace practice. (B16b; Fe, RM-n)

109-B. (Norwegian.) **Techniques of Ore Dressing.** Magne Mortenson. *Tidsskrift for Kjemi, Bergvesen og Metallurgi,* v. 17, no. 1, 1957, p. 6-12.

Flotation and washing processes, magnetic and electrostatic separation. Technical problems in crushing process, screening and classification of crushed ore, separation, choice of dressing process. Review of ore dressing today. 11 ref. (B13, B14)

110-B. (Portuguese.) **Experimental Study on the Production of Sponge Iron in 26% Cr Cast Iron Containers.** Tharcisio D. de Souza Santos. *ABM, Associacao Brasileira de Metais, Boletim,* v. 13, Apr. 1957, p. 67-128.

Influence of variations in diameter of briquetts of "jacutinga" (lamellar hematite), length of reduction cycle, temperature, granulometry and composition of scrap charcoal employed on ore reduction process, percentage of reduction, carburization of metal under study. 15 ref. (B16d; Fe, 6-24)

111-B. (Russian.) **New Methods of Investigating Sintering Process.** V. S. Abramov. *Stal',* v. 17, March 1957. p. 195-199.

The method proposed for experimental sintering by means of removable pans placed on the sintering machine, which considerably widens the possibilities for investigation and control of the sintering process. 4 ref. (B16a, 1-2; Fe)

112-B. (Russian.) **Automatic Speed Control of Sintering Machines.** D. G. Khokhlov, Yu. A. Gyrdymov and M. M. Gordon. *Stal',* v. 17, June 1957, p. 481-488.

Experiments at the Vysokogorsk sintering plant with methods of control of sintering machines for obtaining full sintering; use of the waste gas temperature difference as control impulse. 5 ref. (B16a, S18n, 1-2; Fe)

113-B. (French.) **Physical Chemistry of the Agglomeration of Iron Ores.** A. Roos. *Genie Civil,* v. 134, Mar. 15, 1957, p. 129-133.

Chemical reactions and physical and crystallographic transformations of sintering process. (B16; Fe, RM-n)

114-B. Beneficiation of Low Grade Saskatchewan Uranium Ores. Pt. 4. L. W. Crawford, Brad Gunn, S. D. Cavers and A. B. Van Cleave. *Canadian Journal of Chemical Engineering,* v. 35, Oct. 1957, p. 99-104.

Low-grade pegmatitic ore containing uraninite can be upgraded by flotation by factor of 3.8 to 5.1 with U_3O_8 recoveries varying from 85 to 75%. Most satisfactory combination of reagents involves sodium

hexametaphosphate as conditioner, sodium myristate or palmitate as collector and oleic acid as frother. Addition of conditioner and collector directly to ball mill charge decreases amount of frother required. 7 ref. (B14; U, RM-n)

115-B. Instrumentation for a Sintering Plant. A. A. Latowski. *Industrial Heating,* v. 24, Aug. 1957, p. 1584-1586, 1688.

Emphasizes importance of instrumentation for controlling feed characteristics, mechanical performance of sintering machine and furnace performance. (B16a, 1-2; Fe, RM-n)

116-B. Assessment of Flotation Results. J. C. Nixon. *Institution of Mining and Metallurgy, Bulletin,* no. 607, June 1957, p. 453-469.

A method for assessment of laboratory batch flotation results. Concentrates from flotation tests were taken off in several fractions and cumulative metal or mineral distributions therein graphed against cumulative percentage weights. Results from several similar tests were then approximated as straight lines, which enabled results to be assessed by simple statistical methods. Technique was applied to ores of lead-zinc, sulphide and oxide copper, copper-cobalt and fluorspar. 11 ref. (B14h, 1-4; Pb, Zn, Cu, Co)

117-B. Mixed Firing to Save Solid Fuel in Sintering. H. Rausch and K. Meyer. *Iron and Coal Trades Review,* v. 175, Aug. 16, 1957, p. 389-394.

Process for saving coke breeze in sintering by the combustion of liquid or solid fuel in a hood above the sinter strand. Sinters obtained are of good strength and reducibility. 3 ref. (B16a; Fe, RM-n)

118-B. Elimination of Sulphur and Other Elements During Sintering. B. G. Baldwin and L. F. Burgess. *Iron and Coal Trades Review,* v. 175, Aug. 23, 1957, p. 425-433.

Chemistry of sulphur removal; sulphur evolution during sintering; experiments and results of study on removal of water, carbon dioxide, phosphorus and sulphur, with primary interest centered on latter; conclusions. 12 ref. (B16a; Fe, *S*, RM-n)

119-B. Something New in Sintering. Harold E. Rowen, Patrick V. Gallagher and Thomas E. Ban. *Iron and Steel Engineer,* v. 79, Aug. 1957, p. 133-144.

Development and evolution of sintering in nonferrous and ferrous industries describing sintering machines from round pot to modern continuous equipment; considers heat exchange systems, feed, proportioning and preparation devices. (B16a, 1-2)

120-B. Depression of Pyrite by Cyanide Ions. K. K. Majundar. *Mining Magazine,* v. 97, Sept. 1957, p. 137-139.

Mechanism of depression of pyrite by alkali cyanide is discussed in relation to possible reactions of cyanide ions on pyrite during flotation. 9 ref. (B14h; Fe)

121-B. Dual Process Metallurgy Stretches Inspiration Ore Reserves. Stanley Dayton. *Mining World,* v. 19, Sept. 1957, p. 50-59.

Faced with problem of mining lower grade ore containing increasing proportion of sulphides, Inspiration Consolidated Copper Co. abandoned acid-ferric-sulphate leaching practice, switched to Dual Process, renovated idle concentrator, equipping it with new machinery for treating 15,000 tons of minus-¾ in. residue to implement flotation of sulphides. Details of process and equipment. (B14; Cu)

122-B. Nevada Mills Rewrite Cinnabar Flotation Textbook. Keith Kunze. *Mining World,* v. 19, Sept. 1957, p. 64-66.

Extensive laboratory pilot plant testing followed by commercial-scale application has proven that mercury flotation is useful recovery tool for certain types of ores; that information on mercury flotation in technical literature has been erroneous. Soda ash and sodium silicate have been previously specified as dispersion reagents for cinnabar ore; recent test work shows that these reagents are strong depressants for cinnabar and their use will result in poor recoveries. (B14h; Hg)

123-B. Review of Developments in the Sintering Process. M. F. Morgan. *Blast Furnace and Steel Plant,* v. 45, Oct. 1957, p. 1142-1144.

Chronological survey of design and operation of sintering plants. (B16a; Fe, RM-n)

124-B. Titaniferous Iron Sand Deposits of the Muroran Mine, Hokkaido. Takeo Bamba and Teruaki Igarashi. *Geological Survey of Japan, Bulletin,* v. 7, Dec. 1956, p. 55-59. (CMA)

Illmenite-bearing magnetite is concentrated in some of the diluvial sediments on the end of Muroran peninsula. Some of the placer deposits have been worked by Hokkaido Industrial Co. Ltd. Ore grade averages 15% iron and 2% TiO_2. (B14; Ti, RM-n)

125-B. Effect of Roasting on Recovery of Uranium and Vanadium From Carnotite Ores by Carbonate Leaching. J. Halpern, F. A. Forward and A. H. Ross. *Mining Engineering,* v. 9, Oct. 1957, p. 1129-1134. (CMA)

Effect of roasting carnotite ores in presence of various reagents on subsequent recoveries of uranium and vanadium by carbonate leaching. Roasting at temperatures of about 850° C. with calcium salts, including quick lime generally increased the vanadium extraction. 8 ref. (B15, C19n; U, V)

126-B. (English.) **Study of the Mechanism and Kinetics of Oxidation of Green Magnetite Pellets.** J. O. Edstrom. *Jernkontorets Annaler,* v. 141, Aug. 1957, p. 457-478.

Reaction mechanism; quantitative expressions for rates of oxidation in pure oxygen and in a mixture of oxygen and inert gases; application to shaft furnaces. 27 ref. (B16b, D8; Fe)

127-B. (French.) **Blast Furnaces, Preparation of Blast Furnace Charges. Study of Sintering of Ore Fines and Blast Furnace Dust.** Andre Mercier. *Technique Moderne,* v. 49, July 1957, p. 301-309.

Processing of mix components, handling and storing of blast furnace dust, mixing of raw materials; equipment used in Greenwalt and Dwight-Lloyd sintering processes, exhaust systems and cooling of sintered products; rotary furnace processes. (B16a; Fe)

128-B. (French.) **Crushing and Screening of Ore Fines.** R. Godiniaux. *Technique Moderne,* v. 49, July 1957, p. 310-314.

Necessity and advantages of precrushing; principal types of crushers and screens; choice of crushers; crushing and screening installation at Hayange (Moselle) mine; granulometry of crushed products and use of screened material from this installation. (B13, 1-2; RM-n)

129-B. (Russian.) **Problems of Sintering.** L. I. Kharash, M. I. Shinyakov and S. I. Eliasberg. *Stal',* v. 17, Feb. 1957, p. 106-114.

Various aspects of sintering iron ores. Experimental results show that fluxed sinters give best results in the blast furnace. It is recommended that the sintering surfaces in new machines should not be less than 200 sq. m. 6 ref. (B16a; Fe)

130-B. (Russian.) **Improving the Grain Condition of the Krivoy Rog Sintered Ore.** M. I. Kostyuk, S. K. Grebnev, A. A. Aksenov, P. E. Ostapenko and M. A. Simacheva. *Stal',* v. 17, Feb. 1957, p. 114-118.

Experimental electrically heated screens increased agglomerated ore size from 5-6 mm. to 10-80 mm. in preparation for delivery to the sintering section. This new method is expected not only to raise the capacity of the screens but also to better working conditions. (B14m, B16a; Fe)

131-B. (French.) **Oxidation Reactions of Some Sulphide Ores.** M. Lefevre, J. Lemmerling and A. Van Tiggelen. *Chimie et Industrie,* v. 78, Aug. 1957, p. 107-114.

Oxidation of some sulphide ores (blende, bornite and chalcopyrite) studied by a manometric method in a low-temperature domain (200-300° C.). Reaction consists primarily of a direct sulphation in which the speed-controlling phase is activated adsorption of oxygen. Activation energy of adsorption was measured. Oxidation at higher temperatures (up to 800° C.) was studied by thermogravimetry. Above 400° C., a number of simultaneous and competing reactions are produced which result in formation of sulphates and oxides. (B15n; RM-n)

132-B. (French.) **Combined Production of Manganese Oxide Concentrates and Fertilizers.** A. Baniel, R. Blumberg, E. J. Cejtlin, F. Grynbaum and O. Schacter. *Chimie et Industrie,* v. 78, Aug. 1957, p. 115-120.

Disadvantages of known hydrometallurgical methods for treatment of low-grade Mn ores. Method proposed which begins with leaching of ore sulphur dioxide. Sulphate ion obtained is utilized for production of potassium or ammonium sulphate. Method is example of linking of a metallurgical and another heavy industry, thus achieving more complete utilization of products employed in leaching. 15 ref. (B14, A11c; Mn, RM-n)

133-B. (Italian.) **Magnetic Processing at the San Leone Iron Ore Mine.**

Mario Giusti. *Industria Mineraria,* v. 8, July 1957, p. 479-485.

Equipment and processes in modern beneficiation plant installed by Societa Mineraria e Siderurgica "Ferromin". Dry electromagnetic separation capacity is 100 tons per hr.; wet, 70 tons per hr. Layout drawings, flow sheet.
(B14j, 1-2; Fe, RM-n)

134-B. (Book.) **Iron Ore Beneficiation.** Lawrence A. Roe. 305 p. 1957. Minerals Publishing Co., P.O. Box 85, Lake Bluff, Ill. $5.

Reference work for beneficiation engineers; history and economics of iron mining, iron ore minerals, beneficiation processes.
(B12, B13, B14; Fe, RM-n)

SECTION C

NONFERROUS EXTRACTION and REFINING

1-C. Solvent Extraction Separation of Uranium From Acid Leach Liquors and Pulps. J. R. Ross, J. B. Rosenbaum and J. B. Clemmer. *Intermountain Experiment Station, Bureau of Mines (U. S. Atomic Energy Commission),* AECU-3181, Apr. 1956, 18 p.

Pilot plant work using a kerosene solution of mono ortho dodecyl phosphoric acid. Tentative design for solvent extraction plant proposed. (C19; U)

2-C. Pressure Leaching and Reduction at the Garfield Refinery. J. S. Mitchell. *Mining Engineering,* v. 8, Nov. 1956, p. 1093-1095.

Cobalt recovery from arsenical concentrates involves auto-oxidation acid leaching, filtration of tailings, purification of solution. hydrogen reduction of ammoniacal solution, and electrical furnacing for sulphur removal and granulating metal. (C19, C21; Co)

3-C. Determination of the Number of Electrons Participating in the Electrochemical Reduction of Columbium and Titanium. E. I. Krylov and V. S. Kolevatova. *Henry Brutcher Translation No.* 3686, 6 p. (From *Zhurnal Fizicheskoi Khimii,* v. 29, no. 5, 1955, p. 818-821.) Henry Brutcher, Altadena, Calif.

Coulometric-polarographic determination of reduction stages. (C23, S11; Cb, Ti)

4-C. (English.) **Studies on Electrolytic Refining of Zinc. II. Cathodic Deposition of Lead Dissolved in Zinc Electrolyte.** Motoo Watanabe and Seitaro Fukushima. *Science Reports of the Research Institutes, Tohoku University,* ser. A, v. 8, no. 5, Oct. 1956, p. 406-420.

The lead content in zinc which comes into the cathode only from the electrolytic deposition of ionic state lead was determined. Values of the limiting current density of lead ions estimated by applying diffusion theories. (C23; Zn, Pb)

5-C. (German.) **Method to Produce Aluminum Alloys With High-Melting Elements. II.** F. Erdmann-Jesnitzer and K. H. Erler. *Aluminium,* v. 32, no. 11, Nov. 1956, p. 712-716.

A mixture of metal oxides and aluminum turnings is scattered on the surface of the molten aluminum and ignited with an electric arc. (C general; Al)

6-C. Vacuum Treating Nonferrous Melts at U. S. Naval Gun Factory. Vincent DePierre and Shingo Inouye. *Foundry,* v. 84, Dec. 1956, p. 108-114.

Vacuum treating procedure used in two production units for nonferrous melts. The smaller treats 200 lb. of aluminum or 600 of bronze; the larger treats 600 lb. of aluminum or 1800 of bronze. (C25; Cu, Al)

7-C. The Pyrometallurgy of Halides. W. J. Kroll. *Metallurgical Reviews,* v. 1, pt. 3, 1956, p. 291-337.

Recent progress in the use of halides in extractive metallurgy. (C1p)

8-C. Zone Melting by Electric Arc. R. D. Burch. *North American Aviation, Inc. (U. S. Atomic Energy Commission),* NAA-SR-1688, Nov. 1956, 16 p.

Apparatus uses d.c. arc to produce a molten region. Specimen metal bar rests on a water-cooled hearth and serves as an anode. (C5k)

9-C. Processing of Power Reactor Fuels. R. E. Blanco. *Nuclear Science and Engineering,* v. 1, Oct. 1956, p. 409-419.

Chemical principles affecting a multipurpose centrally located solvent extraction plant which would process all types of heterogeneous fuels. (C19, T11)

10-C. Electric Smelting of Low-Grade Chromite Concentrates. J. P. Walsted. *U. S. Bureau of Mines, Report of Investigations* 5268, Oct. 1956, 28 p.

Proper proportioning includes the correct level of reductant, enough bulk to provide porosity, and the minimum amount of flux to provide a minimum amount of slag of good fluidity. (C21d; Cr)

11-C. (French.) **Heating in Vacuum by Induction.** A. Bussard. *Métallurgie et la Construction Mécanique*, v. 88, no. 10, Oct. 1956, p. 847-849.

Present field of vacuum melting, designs, characteristics of melting furnaces with conducting or non-conducting crucible. (C25)

12-C. (Russian.) **Using Aluminum Powder for Melting Ferrotitanium.** P. F. Snezhko. *Metallurg*, no. 10, Oct. 1956, p. 21-22.

Melting of the furnace charge with a pulverized fraction of aluminum took place smoothly and was accompanied by a considerable reduction of titanium. The consumption of aluminum was sharply reduced. (C26; Fe, Ti, Al, AD-n)

13-C. (Russian.) **Analysis of Indices and Peculiarities of Electrosmelting Ferrosilicon and Chromium-Silicon at Two Plants.** V. V. Rukavishnikov and V. A. Kravchenko. *Stal'*, v. 16, no. 11, Nov. 1956, p. 989-993.

A comparison of output at two plants. Effects of depth of immersion of electrodes in the charge; proper slag treatment.
(C21d, Fe, Si, Cr, AD-n 31)

14-C. (Russian.) **Refining Tellurium and Antimony.** F. I. Vasenin. *Fizika Metallov i Metallovedenie*, v. 3, no. 2, 1956, p. 360-362.

Use of a special retort-dephlegmator for distilling off tellurium and antimony of very high purity.
(C22h; Sb, Te)

15-C. Arc and Vacuum Melting of Titanium. D. E. Cooper and S. A. Herres. *Metal Industry*, v. 89, Dec. 7, 1956, p. 471-474. (CMA)

The development of melting techniques for titanium reviewed. Furnace equipment used in early melting studies described; advantages of the inert electrode type furnace noted. The consumable electrode furnace operates differently from the inert electrode furnace in that the electrode material is driven toward the arc; normally, there is a feedback control for measuring arc voltage or current and a partial vacuum is preferred for arc stability and degassing. Research by the Bureau of Mines on pool size and shape is cited; it would be desirable to increase the superheat and volume of the molten pools, but reversing the polarity of the electrodes does not accomplish this. (C5h; Ti)

16-C. Chemistry and Reduction of Zirconium. W. W. Stephens. Paper from "Zirconium — Technology and Economics". Atomic Industrial Forum, p. 5-10. (CMA)

The chemical reactivity and amphoteric character of zirconium are cited. Facts concerning the abundance of zirconium ores and the occurrence of hafnium in them are reviewed. Methods are discussed for the production of zirconium: thermal decomposition of the iodide process refines zirconium which is already reduced to the metal and the Kroll reduction is the main route used in extractive metallurgy. A subsequent discussion of the paper encompasses sampling for quality control and the difficulty of keeping the oxygen content low.
(C general, A11a; Zr)

17-C. Melting of Zirconium. W. C. Greenleaf. Paper from "Zirconium—Technology and Economics". Atomic Industrial Forum, p. 11-17. (CMA)

Of the four melting techniques noted, the consumable arc-melting technique with water-cooled copper crucible has met with the most success. The Allegheny-Ludlum procedure for melting 1000-lb. Zircaloy-2 ingots includes sponge compacting, welding the compact according to a proprietary pattern, inserting the compacted electrode into the furnace, evacuating the chamber, flooding with argon, re-evacuating and then re-introducing argon. After the current is supplied, melting is allowed to go to completion. After the ingot cools, secondary melting may be performed; more current is necessary because of increased density. Discussion included. (C5h; Zr)

18-C. Commercial Products Available. E. E. Hayes. Paper from "Zirconium—Technology and Economics". Atomic Industrial Forum, p. 73. (CMA)

The Bureau of Ships and the AEC have sponsored arc-melting projects on zirconium by the Bureau of Mines. Present practice at the Albany station is to melt the metal into a water-cooled copper crucible (1-in. diam. by 1-in. deep), using a high input and keeping the pool

deep. The melt is then quickly poured from the crucible, leaving a slight skull, into a suitable mold. Graphite molds give sound castings. (C5h; Zr)

19-C. Vacuum Arc Melting Zirconium. L. S. Deitz, Jr. Paper from "Zirconium—Technology and Economics". Atomic Industrial Forum, p. 79-84. (CMA)

Climax Molybdenum studied the vacuum arc melting of zirconium in 1952-1953. The experimental arc-melting furnace used is described; the process is a batch-type. The Kroll-type sponge melted in the a.c. arc with much splatter, causing porosity on the outside of the ingot. It is difficult to raise the bath temperature without increasing the melting rate, and the removal of the porous deposit on the mold wall was precluded. The problem of tin segregation in Zr-Sn alloys was not solved. Data tabulated. (C5h; Zr)

20-C. Commercial Products of Zirconium Available From National Research Corporation. F. H. Greene, Jr. Paper from "Zirconium—Technology and Economics". Atomic Industrial Forum, p. 91. (CMA)

The activities of the National Research Corp. with zirconium are reviewed. Metal and alloy ingots weighing 25 lb. and zirconium shaped castings to specifications are produced. Melting and heat treating equipment for zirconium and titanium are being designed and manufactured. (C5, J general; Zr)

21-C. (English.) **Study of Chlorination Reactions of Titanium Monoxide.** A. N. Zelikman and T. Segarchanu. *Journal of General Chemistry of the U.S.S.R.*, v. 26, no. 3, March 1956, p. 721-724. (CMA)

The chlorination of TiO was studied in 300 to 700° C. range. TiO chlorinates faster than TiO_2, even at 300° C., and the presence of carbon accelerates this trend. The maximum degree of chlorination is 50%. The reaction proceeds as $2TiO + 2Cl_2 \rightleftharpoons TiCl_4 + TiO_2$. Data are tabulated and illustrative material is shown. 6 ref. (C19r; Ti)

22-C. (French.) **Defect Elimination in Leaded Bronze.** *Journal d'Informations Techniques des Industries de la Fonderie,* no. 81, Oct. 1956, p. 3-5.

The defect is characterized by numerous irregular slag inclusions which on machining produce a grayish powder. Composition of slag and procedure for elimination are given. (C21; Cu, 9-19, RM-q)

23-C. (Russian.) **Separation of Zirconium and Hafnium.** L. N. Komissarova and V. E. Plyushchev. *Uspekhi Khimii,* v. 25, Oct. 1956, p. 1197-1222. (CMA)

The literature on the separation of zirconium and hafnium is surveyed. Twenty-seven methods are examined, classified under the following groups: (1) fractional crystallization; (2) fractional precipitation; (3) thermal decomposition; (4) sublimation and distillation of zirconium and hafnium halogenides, or of their molecular compounds (e.g. with phosphorus pentachloride); (5) adsorption and ion exchange; and (6) extraction of zirconium and hafnium compounds with organic solvents. 123 ref. (C general; Zr, Hf)

24-C. Production of Titanium Metal. Raw Materials and Methods Reviewed. *Chemical Age,* v. 76, Dec. 22, 1956, p. 475-476. (CMA)

Chemical analyses of rutile and ilmenites from Florida and Canada are compared. Rutile is more desirable because it is more readily chlorinated. The direct chlorination of ilmenite produces $FeCl_3$, which is very convenient, and the chlorination of titania slags also has drawbacks. A process has been described which involves carbon reduction of ilmenite and magnetic separation of iron from the resulting titanium oxycarbide. An Acheson-type furnace is used. Details as to charge, furnace cooling and crushing are given. (C1p; Ti, 14-9)

25-C. ICI's Huge Titanium Project Benefits Fabricating Industries. *Chemical Industry and Engineering,* v. 8, Nov. 1956, p. 43-47. (CMA)

History of ICI's interest in titanium. After some research a sodium reduction process was chosen because of cost advantages, especially in leaching out and disposing of the chloride byproduct. The granular titanium is packed in drums and shipped to Witton to be wrought and fabricated. Titanium is used in models of advanced British aircraft. (C19r; Ti)

26-C. Arc and Vacuum Melting of Titanium. D. E. Cooper and S. A. Herres. *Metal Industry,* v. 89, Dec. 14, 1956, p. 499-500. (CMA)

In arc melting titanium, the solenoid-type magnetic field which con-

trols arc motion also stirs the molten pool. Increasing the stirring rate decreases surface porosity to a minimum point and then increases it. Effects on chemical homogeneity also studied. The stirring breaks up large columnar grains which usually are evident when the ingot solidifies, but stirring must be rapid if high melting currents are used. (C5h; Ti)

27-C. The Inventions of Bessemer in Relation to Nonferrous Metals. Hugh O'Neill. *Metallurgia,* v. 54, Dec. 1956, p. 269-273.

Account to the South Wales Local Section of the Institute of Metals referring to Bessemer's inventions in nonferrous metallurgy and procedures involving pneumatic oxidation. 15 ref. (C21)

28-C. South African Uranium Leach Plants. L. A. Waspe. *Mining Magazine,* v. 95, Dec. 1956, p. 332-339.

South African practice in obtaining uranite and monazite from gold ore residues. (C19n; Au, U)

29-C. (French.) **Thorium and the Fissionable Elements.** *Energie Nucleaire,* v. 76, no. 4, Winter 1956, p. 25-31.

Properties of uranium^{235}, uranium^{233} and plutonium; separation of uranium^{235} from irradiated thorium. (C6, P general, Q general; Th, U, Pu)

30-C. (French.) **French Manufacture of Aluminum.** Gaston Dufour. *L' Ingenieur,* v. 42, no. 168, Winter 1956, p. 7-11.

Handling of bauxite, production and processing of alumina, preparation of ingots. (C23, F21; Al)

31-C. (Russian.) **Methods for the Isolation of Carrier-Free Radioactive Isotopes. Communication 3. Isolation of the Radioactive Indium Isotope In^{113m}.** N. P. Rudenke and Z. V. Pastukhova. *Zhurnal Neorganichaskoy Khimii,* v. 1, Sept. 1956, p. 2164-2170.

Method for the isolation of In^{113m} from tin irradiated with neutrons whereby the recoil atoms of the radioactive indium are concentrated in a high-intensity electric field. Deposition of radioactive indium at the electrode proceeds best when a field of the intensity of 3000-4000 volts per centimeter is applied for 30-150 min. (C6a; In, Sn)

32-C. Arc and Vacuum Melting of Titanium. D. E. Cooper and S. A. Herres. *Modern Metals,* v. 12, Jan. 1957, p. 74, 76, 78, 80, 82. (CMA)

Work of the Climax Molybdenum Research Laboratories is cited which proved useful in adapting to the vacuum arc melting of titanium. A furnace for titanium melting was developed. It was found that straight polarity direct current generated the most heat in the titanium pool; the current maximum is limited by the melting point of the electrode. For vacuum melting, the power supply is a 3-phase, full wave rectified direct current. Induction stirring, feedback control and magnetic arc control are other features discussed. (C5h, 1-23; Ti)

33-C. Zirconium-Precipitation Pilot Plant. G. T. Parish, et al. U. S. Atomic Energy Commission. AECD-3742, Sept. 30, 1950, 22 p. (CMA)

The pilot plant, which uses the phthalic acid precipitation of zirconium from $ZrCl_4$, was studied so that variables could be better controlled by design, and to determine the effect of leaching time on phthalate recovery. Data are tabulated and equipment modifications discussed. (C1p, A9j; Zr)

34-C. Recovery of Iodine From Crystal Bar Unit Wash Water. H. R. Hoge and Z. M. Shapiro. *U. S. Atomic Energy Commission. WAPD-RM-35,* June 20, 1951, 6 p. (CMA)

All iodine is thrown away, in the usual iodide zirconium process which involves recycling of the iodine three times. A survey is presented for iodine reclamation methods. The simplest and cheapest proved to be the chlorine oxidation of the iodines to free iodine, which is not too soluble in wash water. A plant design for such reclamation is suggested and a diagram is shown. 12 ref. (C1p, A11d; Zr, I)

35-C. (German.) **Electrolysis of Titanium From Melted Electrolytes.** Kurt Schwabe. *Freiberger Forschungshefte,* no. B17, 1956, p. 5-17. (CMA)

An outline of attempts by various workers at an electrolytic reduction of titanium is supplemented by a short description of the author's own experiments. With a melted mixture of K_2TiF_6 and NaCl as electrolyte he uses an anode made of a compressed mixture of titanium dioxide and carbon. Lower chlorides of titanium probably form as an intermediate reaction product. This method introduces a titanium-containing anode for a continuous supply of titanium to the electrolyte. Only thin films of metallic titanium

have been obtained so far. In another series of experiments the author supplies a graphite (or steel) anode with $TiCl_4$ vapors, using as a bath a eutectic mixture of alkali chlorides with a view to reducing the temperature of the process and thus obtaining a purer product. The method differs from procedures described in some British patents in that the deposition of titanium takes place directly, and not after a stepwise reduction of $TiCl_4$ into lower chlorides by means of multiple cathodes. 16 ref. (C23n; Ti)

36-C. (German.) **Arc Smelting in a Vacuum.** W. J. Kroll. *Metall,* v. 11, Jan. 1957, p. 1-7.

Electrical phenomena in diluted gases, glow discharge, sponge electrode and its properties, the hydrogen problem, smelting in a partial vacuum. 16 ref. (C25, C21d)

37-C. (Russian.) **"Anomalous" Valencies of Rare Elements in Processes for Their Separation. Communication I, The Electrolytic Reduction of Ytterbium.** D. I. Ryabehikov, Yu. S. Sklyarenko, N. S. Stroganova. *Zhurnal Neorganicheskoy Khimii,* v. 1, Sept. 1956, p. 1954-1967.

Conditions which influence separation of ytterbium by H. McCoy's method consisting of the electrolytic reduction of ytterbium sulphate in the presence of complex-forming citrate. (C23n; Yb)

38-C Molybdenum I. Production and Fabrication. D. O. Pickman. *Alloy Metals Review,* v. 8, Dec. 1956, p. 2-8. (CMA)

Properties and general uses of molybdenum reviewed. Molybdenum has, until recently, been produced exclusively by powder metallurgy, but vacuum arc melting is threatening to replace it. The improvements to be sought in molybdenum powder are lower oxygen content, better flow and larger particle size. Reduction in deep instead of shallow powder beds has advantages. Applicability of powder metallurgy method to making billets of several cwt. has been shown, but the arc-melting method is to be preferred; purity is improved by multiple melting. Homogeneous alloying is difficult by the arc melting method. Optimum properties in molybdenum are achieved by working the metal. Forging, joining and extrusion are discussed. 11 ref. (C general, H general, F general; Mo)

39-C. The Snow Lake Cyanidation Circuit. B. G. MacDermid and N. R. Stewart. *The Canadian Mining and Metallurgical Bulletin,* v. 50, Jan. 1957, p. 21-27.

Problems encountered in gold cyanidation circuit from 1949 to 1954, including need for close alkalinity control, temperature control, pre-aeration, and effects of lead salts and sodium cyanide vs. calcium cyanide. (C19p; Au)

40-C. Separation by Stages—New Bid For Pure Zirconium. *Chemical Week,* v. 80, Feb. 2, 1957, p. 58-59. (CMA)

A four-stage process of zirconium production is described which is based on selective reduction of $ZrCl_4$ to $ZrCl_3$ and disproportionation. USI has taken an option on the process, originated in Australia, for its Ashtabula plant. Zircon is converted to ZrC for a raw material. The use of chlorine vs. iodine in the process is discussed. (C1p; Zr-a)

41-C. Reduction of Titanium Chloride by Solutions of Alkalinous Metals in Their Fused Chlorides. R. S. Dean, et al. *Chicago Development Association, Contributions to Titanium Metallurgy. Paper No.* 1, 1957, 9 p. (CMA)

The coarse titanium crystals produced by reacting fused alkaline chloride solutions of both $TiCl_4$ and an alkaline metal are formed in an electrolytic cell in which the titanium chloride is produced anodically and the alkali metal is produced cathodically. Electrolyte compositions, electrode potential and crystal characteristics are discussed. 20 ref. (C23p, C1p, N12d; Ti)

42-C. The Chemistry of the Reduction of Titanium Chloride in Fused Alkalinous Chloride by Solutions of Alkalinous Metals. R. S. Dean, L. D. Resnick and I. Hornstein. *Chicago Development Association, Contributions to Titanium Metallurgy. Paper No. 3,* 1957, 9 pp. (CMA)

The equilibria in solutions of fused salts with titanium chloride and alkali metal and the conditions under which titanium forms were investigated; chemical analysis of the solutions was the tool used. The Ti^{+2} ion was determined in acidic ferric solutions and the amounts of free sodium, calcium and strontium present in their fused chlorides were checked by the cupric acetate-anhydrous methanol procedure. (None of the lower chlorides of titanium reduce copper below the cuprous state). The reactions are considered from the phase rule point of view. (C1k; Ti)

43-C. Electrodeposition of Metals From Organic Solutions. III. Preparation and Electrolysis of Titanium and Zirconium Compounds in Nonaqueous Media. W. E. Reid, Jr., J. M. Bish and A. Brenner. *Electrochemical Society, Journal,* v. 104, Jan. 1957, p. 21-29. (CMA)

Nonaqueous solutions of titanium and zirconium compounds were electrolyzed in electrodeposition attempts. Most promising were ether solutions of titanium and zirconium halides, hydrides, borohydrides and organometallics. A bath with hydrides and borohydrides gave Al-6Ti alloys and Al-45Zr alloys. Lower valent titanium compounds in organic solutions were studied. Preparative procedures are appended. 38 ref. (C23p; Ti, Zr)

44-C. Preparation of Zirconium and Hafnium Metals by Bomb Reduction of Their Fluorides. O. N. Carlson, F. A. Schmidt and H. A. Wilhelm. *Electrochemical Society, Journal,* v. 104, Jan. 1957, p. 51-56. (CMA)

A bomb reduction of zirconium and hafnium tetrafluorides with calcium is described. Reduction step studied and those factors which affect metal quality and yield determined. The zirconium produced was 99.8% pure and was readily cold rolled. Hafnium, however, was embrittled by atmospheric contamination and carbon; reduction yields of 96% were obtained. 7 ref. (C1p; Zr, Hf)

45-C. Anaconda's New Aluminum Plant Now Producing at Capacity. James F. Smith. *Engineering and Mining Journal,* v. 158, Jan. 1957, p. 80-85.

Plant patterned after Pechiney plant at St. Jean de Maurienne, France. (C general, A4p; Al)

46-C. Moab Mill Starts Making U_3O_8 Cake. Theodore Izzo, Lew Painter and Roman Chelminski. *Engineering and Mining Journal,* v. 158, Jan. 1957, p. 90-91.

America's latest uranium ore concentrating plant, the twelfth, uses resin-in-pulp process. (C19a; U)

47-C. Uranium From Gold Wastes. William Q. Hull and Ewen T. Pinkney. *Industrial and Engineering Chemistry,* v. 49, Jan. 1957, p. 1-10.

Uranium from pulp, ion exchange recovery, recovery of manganese, concentration by flotation, sulphuric acid production. 9 ref. (C19s, B14h; U, Au)

48-C. Electrodeposition of the Actinide Elements. Roy Ko. *Nucleonics,* v. 15, Jan. 1957, p. 72-77.

Experiments in the electrode position of actinide elements—thorium, uranium, neptunium, plutonium, americium and curium. 29 ref. (C23n; Th, U, Np, Pu, Am, Cm)

49-C. The Production of Zirconium and Hafnium. S. M. Shelton, E. D. Dilling and J. H. McClain. *Progress in Nuclear Energy Series V. Metallurgy and Fuels,* v. 1, 1956, p. 305-351. (CMA)

Zirconium ores, history, commercial production, uses and separation from hafnium are reviewed and discussed. Procedures for the production of reactor grade zirconium, including chlorination, purification, reduction, vacuum distillation, sponge handling, arc melting. Pure hafnium is produced similarly. 65 ref. (C general; Zr, Hf)

50-C. The Preparation and Properties of Rare Earth Metals. F. H. Spedding and A. H. Daane. *Progress in Nuclear Energy, Series V. Metallurgy and Fuels,* v. 1, 1956, p. 413-431. (CMA)

The best preparation of the high-purity lanthanons involves reduction of the trichloride with calcium under inert atmosphere in tantalum crucibles. However, samarium, europium and ytterbium are only reduced to the dichloride and are preferably prepared by reduction of the oxides with excess lanthanum or cerium and distilled. Methods of preparing the anhydrous fluorides are noted. Data are presented on melting points, vapor pressures, crystal structures, densities, resistivities, heat capacities, magnetic properties, thermal expansion and compressibilities. 32 ref. (C1p, P general; EG-g)

51-C. A New Acid Process for Uranium Ores. E. C. Bitzer. *Queensland Government Mining Journal,* v. 57, July 20, 1956, p. 497-499.

Uranium recovery process, grinding and leaching, ion exchange treatment. (C19s, C19n, B13c; U)

52-C. Electrodeposition of Titanium. W. E. Reid, Jr., J. H. Connor and A. Brenner. *U. S. Air Force, Wright Development Center, Technical Report 54-485, Part 3,* Sept. 1956, 18 p. (PB 121721). Abstracted in *U. S. Government Research Reports,* v. 27, Jan. 18, 1957, p. 18. (CMA)

Use of sodium or potassium borohydride as an alternative to lithium boronhydride studied in the prepara-

tion of titanium and zirconium borohydrides; chloroborohydride etherates of titanium were prepared for use in the Ti-Al bath. Magnesium alloys of titanium and zirconium were obtained from a hydride-type bath. Codeposition of hafnium and thorium with aluminum from a borohydride bath was studied.
(C23n; Ti, Zr, *Hf, Mg, Th, Al*)

53-C. Zirconium Purification Pilot Plant. D. C. Lea, et al. *U. S. Atomic Energy Commission, AECD-3743,* Sept. 12, 1950, 35 p. (CMA)

The operation of a pilot plant for zirconium purification was studied. The use of ammonium phthalate to precipitate zirconium selectively from $ZrCl_4$ is practical at this level of operation; loss of phthalate can be reduced to less than 20% and zirconium losses are slight. The procedure is improved by incorporating an overflow system, masking some of the filter section, use of a vacuum control valve, a more powerful agitator, flow meters for the zirconium feed, drains in the recycle drum, reduction of the amount of excess phthalate, and increasing the preheater temperature. (C27; Zr)

54-C. The Production of Zirconium by Fused Salt Electrolysis. M. A. Steinberg. *U. S. Atomic Energy Commission, NYO-1025,* Oct. 26, 1949, 116 p. (CMA)

Program for investigating the fused salt electrolysis of zirconium. Decomposition potentials of K_2ZrF_6 and $ZrCl_4$ in salt mixtures established. A survey of bath compositions show that NaCl with 25 to 35% K_2ZrF_6 is superior; 20-50 amp per sq. dm. current densities and temperatures above 1450° F. give good results, but use of higher densities and temperatures may give better results. Water washing of the bath was simplified. Retaining zirconium as a plate would make the method more attractive, and this may be accomplished at the higher temperatures. (C1p; Zr)

55-C. The Large Scale Separation of Zirconium and Hafnium. J. M. Googin. *U. S. Atomic Energy Commission Y-B65-103,* Sept. 4, 1956, 20 p. (CMA)

Only two Zr-Hf separation methods are economical for expanded operations: countercurrent extraction of the nitrates with tributyl phosphate, and countercurrent extraction of the thiocyanates from hydrochloric solution with methyl isobutyl ketone. The chemistry of the two processes is discussed at length, and equipment considerations are dealt with. The efficiency of the two is compared. 21 ref. (C28; Zr, Hf)

56-C. The Operation and Progress of the Properzi Mill. *Wire Industry,* v. 24, Jan. 1957, p. 65-66, 77.

Outlines Properzi's process for continuous casting of aluminum wire rod with special reference to the improved No. 6 model machine allowing a stated capacity of 3300 lb. of rod per hr. (C5q; Al, 4-5)

57-C. (French.) **The Manufacture of Aluminum.** Gaston Dufour. *L'Ingénieur,* v. 42, no. 168, Winter 1956, p. 7-11.

Description of the sources of supply of aluminum; methods of exploiting and treatment of bauxite; electrolytic reduction, smelting and casting. (C general, A11a; Al)

58-C. (German.) **Recent Developments in the Field of Molybdenum.** Friedrich Benesovsky. *Vakuum-Technik,* v. 5, Dec. 1956, p. 196-198. (CMA)

Three of the newer methods for the production of ingots from pure molybdenum powder outlined and advantages discussed. The starting material for all three methods is obtained by transformation of the molybdenum ore into MoO_3, its purification by sublimation at 700° C., followed by reduction with hydrogen in an electric furnace. Ingots are then produced either by direct sintering, indirect sintering or high vacuum arc-melting.
(C21d, C5h, H15n; Mo)

59-C. (Russian.) **Cathode Process in the Deposition of Thorium From Fused Electrolytes.** M. V. Smirnov and L. D. Yushina. *Izvestiya Akademii Nauk SSSR, Otdeleniye Khimicheskikh Nauk,* Nov. 1956, p. 1285-1293.

The polarization of a molybdenum cathode at 600, 700, and 800° C. during the electrolysis of thorium tetrachloride of tetrafluoride dissolved in a eutectic mixture of the chlorides of lithium and potassium was studied. It was established that at relatively low current densities reduction of Th^{4+} to Th^{2+} takes place at the cathode. (C23p; Th)

60-C. (Russian.) **Germanium and Its Applications.** N. P. Sazhin. *Khimicheskaya Nauka i Promyshlennost',* v. 1, Sept.-Oct. 1956, p. 487-491.

Chemical procedures by which pure germanium is prepared and the zone

method of fractional crystallization, whereby a still higher degree of purity is achieved. Discusses germanium crystal detectors, the design of germanium point contact and junction diodes, germanium transistors (triodes), germanium rectifiers, photocells (photodiodes), thermistors, and film resistances. Reviews briefly the subject of germanium alloys. (C28k, T1; Ge)

61-C. (Russian.) **Elemental Silicon of High Purity.** N. N. Murach. *Khimicheskaya Nauka i Promyshlennost'*, v. 1, Sept.-Oct. 1956, p. 492-495.

Applications of silicon, with particular stress on the uses of pure silicon as a semiconductor material. Critical review of methods for the production of pure silicon.
(C general, T1; Si)

62-C. (Russian.) **Rubidium and Cesium, Their Applications and the Methods of Producing Them.** V. Ye. Plyushchev, Cand Chem Sci and I. V. Shakhno. *Khimicheskaya Nauka i Promyshlennost'*, v. 1, Sept.-Oct. 1956, p.534-539.

Methods for the production of compounds of rubidium and cesium and of the metals themselves. Applications of the metals and of their compounds, with particular attention to uses in photocells.
(C general, T1; Rb, Ce)

63-C. (Russian.) **Production and Applications of Selenium and Tellurium.** A. A. Solovushkov, L. A. Soshnikova and M. Y. Yezernitakaya. *Khimicheskaya Nauka i Promyshlennost'*, v. 1, Sept.-Oct. 1956, p. 543-547.

Methods of production and applications of selenium and tellurium reviewed with reference to uses of selenium as a semiconductor material in photocells, rectifiers, etc., and to newly developed applications of tellurium as a semiconductor material. (C general, T1; Se, Te)

64-C. (Russian.) **The Use of Crystallization Processes for the Preparation of Highly Purified Substances.** D. A. Petrov and B. A. Kolachev. *Zhurnal Fizicheskoy Khimii*, v. 30, Oct. 1956, p. 2340-2347.

Purification of substances by the method of fractional "zone" crystallization from melts and the drawing out or "pulling" of monocrystals from molten material. Zone crystallization of silicon, iron, copper, platinum, silver, selenium, tellurium aluminum, indium, antimony, bismuth, and other elements. (C28k)

65-C. (Pamphlet.) **Electrolytic Titanium.** R. S. Dea, ed. Chicago Development Corp., Riverdale, Md., 1957, 35 p. (CMA)

In the titanium electrorefining process of Chicago Development Corp., $TiCl_{2\ 3}$ porduced at the anode and alkali metal solution at the cathode react to form titanium particles. The oxygen dissolved in the alloy is converted to TiO_2 and remains as an anodic residue. An analytical evaluation of electrolytes showed that NaCl-2.5% $TiCl_{2\ 3}$ is superior. The reaction equilibria, alloy behavior above the β transus, anodic behavior vs. cathode deposit structure, and preparation of the electrolyte and anode were studied. 13 ref. (C23p; Ti)

66-C. Preparation of Rare Earth Concentrates. D. C. Stewart and J. P. Faris. *Journal of Inorganic and Nuclear Chemistry*, v. 3, Aug. 1956, p. 64-66. (CMA)

In recovering mixed yttrium-group lanthanons (Gd-Yb) with a type of ion-exchange resin column from a large glycollic acid solution, it was found that a crude separation was effected. Data show an apparent tendency in each run for a given lanthanon to act "pivotally", depending on the composition of the mixture. (C19s; EG-g)

67-C. Separation of the Lanthanides by Ion Exchange With Alpha-Hydroxy Isobutyric Acid. G. R. Choppin and R. J. Silva. *Journal of Inorganic and Nuclear Chemistry*, v. 3, Sept. 1956, p. 153-154. (CMA)

A Dowex-50 X-12 (400-mesh) resin was used in ion exchange separation of the lanthanons with ammonium α-hydroxy isobutyrate. The large separation factors necessitated a number of elutions using combinations of three to five neighboring lanthanons. Various molarities and acidities favor separation of different groups. The flow rate with α-hydroxy isobutyric acid is five times that with EDTA. Conditions necessary for dimer formation should be avoided. (C19s; EG-g)

68-C. Electrolytic Separation of Metallic Isotopes. James H. Andrews, Ivan Ceresna, F. A. Rohrman and William F. Utlaut. Chemical Engineering Progress, Symposium Series, *Nuclear Engineering*, Part II, v. 52, no. 19, 1956, p. 49-52.

By use of nickel-63 as a radioactive tracer it was found possible with electrochemical technique to enrich the concentration of nickel in

the cathodic deposit. 5 ref.
(C6; Ni)

69-C. Vacuum Melted Alloys for Forged Parts. W. W. Dyrkacz and E. E. Reynolds. *Product Engineering,* v. 28, Feb. 1957, p. 143-145.

Advantages and limitations of consumable electrode and induction heating processes; effect on cleanliness, segregation, and elevated-temperature properties; relative costs and growing fields of use.
(C5h, C5j, 1-23)

70-C. (French.) **Modern Processes of Obtaining Pure Metals.** Claude Bertrand. *Nature,* no. 3261, Jan. 1957, p.

Influence of impurities on physical, electrical, mechanical and various properties of metals; determination of amounts of impurities; outline of principal methods of refining metals.
(C28, P general, Q general, 3-19)

71-C. Recovery of Uranium From Phosphate Rock. R. E. Stedman. *Chemistry and Industry,* no. 6, Feb. 9, 1957, p. 150-153.

Method of recovery of uranium from solution by chemical precipitation. (C27; U)

72-C. Equilibrium Between Titanium Metal, Titanium Dichloride, and Titanium Trichloride in Molten Sodium Chloride-Strontium Chloride Melts. S. Melgren and W. Opie. *Journal of Metals,* v. 9, Feb. 1957, p. 266-269. (CMA)

In the electrolytic deposition of titanium from a fused salt bath, an important equilibrium is that which exists in the reaction $3TiCl_2 \rightleftarrows 2TiCl_3 + Ti$. The present study indicates that the equilibrium existing in a fused $NaClSrCl_2$ bath containing titanium, Ti^{+2} and Ti^{+3} is unaffected by changes in temperature over the 650 to 800° C. range or in total titanium concentration in the range 1.7 to 5.0%. There is a slight trend for the equilibrium constant $K = (N_{TiCl_3})^2/(N_{TiCl_2})^3$ to decrease with increasing titanium concentration. Varying the $SrCl_{2NaCl}$ ratio has a great effect on the equilibrium. In the course of the study an analytical method for $TiCl_2$ was developed, based on hydrogen evolution from a weak HCl solution.
(C23p; Ti)

73-C. Preparation of High-Purity Electrolytic Chromium. P. M. Gruzensky and F. E. Block. *U.S. Bureau of Mines, Report of Investigations* 5305, Jan. 1957, 11 p.

Preparation of the metal by electrolysis of chromic acid solutions and determinations of the conditions that yield optimum results. The apparatus is described, as well as the parameters that received consideration. Ion exchange resins were employed to remove cation impurities from the electrolyte. 15 ref. (C23p, C19s; Cr)

74-C. (French.) **The Present State of Nickel Production Techniques.** L. F. Denaro. *Métallurgie et la Construction Mécanique,* v. 89, Jan. 1957, 25-31.

History of nickel production; various categories of ores; refining processes used for sulphuretted ores and oxidized ores; statistics concerning world trade and consumption of nickel. (C general, A4p; Ni, RM-n)

75-C. (German.) **Manufacture of Calcium Metal. I. Electrolytic Process.** Guenther Wehner. *Freiberger Forschungshefte,* v. B17, Oct. 1956, p. 18-33.

A new process of manufacturing calcium metal which consists of electrolyzing molten calcium chloride at a copper cathode, and obtaining thereby a copper-calcium alloy which is decomposed by means of vacuum distillation (section II below).
(C23g; Ca)

76-C. (German.) **Manufacture of Calcium Metal. II. Distillation Process.** Hellmuth Seliger. *Freiberger Forschungshefte,* v. B17, Oct. 1956, p. 34-49.

A method of purification of the product in section I (above) based on the fact that the easily volatilized calcium is separated by evaporation from the less volatile impurities which remain as a residue. 1 ref.
(C22h; Ca)

77-C. (Japanese.) **New Quantitative Precipitation of Thorium and Rare Earths From a Homogeneous Solution, and Its Application to the Extraction of Some Elements From Ores.** Zenzi Hagiwara. *Chemical Society of Japan, Journal, Industrial Chemistry Section,* v. 59, Dec. 1956, p. 1378-1383. (CMA)

Monazite and bastnaesite were used, and diethyloxalate was newly adopted as a precipitating agent. A mixture of perchlorate-sulphuric acid, or simply perchlorate, was used to decompose the monazite, and extraction rates of rare earths and thorium were sought. Conditions of the basic experiments were employed in incorporating new methods for determination of these substances in monazite sand. 10 ref.
(C27, S11; Th, EG-g)

78-C. (Japanese.) **Studies on Electrolytic Refining of Aluminum at Low Temperature in Aluminum Chloride Baths (Part II). Influences of Alternating Current Superposed on Aluminum Deposits, and Unusually High Current Efficiencies.** Rinzo Midorikawa. *Denki Kagaku,* v. 24, Nov. 1956, p. 511-515.

Attempts to prevent the aluminum electrodeposits from developing irregular crystals; superposition of 500 cycles alternating current on applied 60 cycles. 10 ref. (C23p; Al)

79-C. Reactor Grade Uranium by Extraction of Slurries. D. S. Arnold and B. G. Ryle. *Chemical Engineering Progress,* v. 53, Feb. 1957, p. 63F-64F.

Investigation of the refining of a number of uranium ores by solvent extraction of slurries by digesting the ore concentrate in nitric acid producing uranium of reactor grade. Various impurities in ores can greatly affect product recovery, product purity and refinery operations. (C19; U)

80-C. Preparation of Power Reactor Fuels for Aqueous Processing. J. E. Savalainan and R. E. Blanco. *Chemical Engineering Progress,* v. 53, Feb. 1957, p. 78F-81F.

Converting fuels fabricated in nitric acid insoluble metals to nitric acid solutions suitable for reprocessing by solvent extraction. The Darex process uses dilute aqua regia to dissolve stainless steel fuels and distillation to recover hydrochloric acid and nitric acid in titanium equipment. The Zircex process uses hydrogen chloride gas or a liquid inorganic chlorinating agent to remove selectively zirconium from jacket or core alloys at 300-400° C. as volatile zirconium tetrachloride. (C19, T11; SS, Zr)

81-C. Pure Rare Earths by Ion Exchange. T. F. Meinhold and H. E. Kremers. *Chemical Processing,* v. 20, Mar. 1957, p. 12-13, 18-19. (CMA)

Ion exchange process for separating the lanthanons reviewed. Some of the individual metals are thus made available in commercial amounts. Lindsay Chemical Co. markets the lanthanons. (C19s; EG-g)

82-C. Electrodeposition of Uranium at the Microgram Level. C. L. Rulfs, A. K. De and P. J. Elving. *Electrochemical Society, Journal,* v. 104, Jan. 1957, p. 80-83.

Recovery of microgram and submicrogram quantities of uranium by electrodeposition has been studied, using radioactive uranium 233 as a tracer with and without the presence of microgram quantities of natural uranium as carrier. Optimum results were obtained in an ammonium oxalate medium with electrolysis at 80-85° C. 14 ref. (C23p, A11d; U)

83-C. Mineral Digest—Aluminum. *Indian Minerals,* v. 10, July-Sept. 1956, p. 263-271.

Extraction of alumina; composition of aluminum ores such as bauxite, alumite and aluminous fireclays. (C general; Al, RM-n)

84-C. An Investigation of the Iodide Method of Refining Zirconium—II. Lower Zirconium Iodides and the Influence of Tetra-Iodide Pressure Upon the Rate of Metal Deposition. V. S. Emelyanov, P. D. Bystrov and A. I. Evstyukhin. *Journal of Nuclear Energy,* v. 4, no. 1. (Part II. *Soviet Journal of Atomic Energy,* v. 1, no. 3), Feb. 1957, p. 253-261. (CMA)

In the iodide refining of zirconium the lower iodides forming on the metal surface do not interfere with deposition, except that they change the vapor pressure and therefore the deposition rate. Rate reduction comes about through a decrease in the diffusion coefficient at increased pressures. (C1p; Zr)

85-C. Electrolytic Titanium—I. R. S. Dean. *Metal Industry,* v. 90, Feb. 22, 1957, p. 143-146. (CMA)

Development by Chicago Development Corp. of a process for electrorefining titanium scrap. Process entails the production of both reactants in the cell; the product is a powder. The oxygen problem is considered and measurements are given of the potential on titanium-oxygen alloys in the beta region in four electrolytes. The salt bath electrolytes (containing in general lower titanium chlorides and mixtures of two or more of sodium chloride, potassium chloride, lithium chloride). (C23p; Ti, RM-p)

86-C. Radiochemical Procedure for Individual Rare Earths. L. R. Bunney, et al. *Nucleonics,* v. 15, Feb. 1957, p. 81-83. (CMA)

A procedure for isolating, purifying, separating by ion exchange and precipitating individual lanthanons.

Steps in each operation are enumerated. A Dowex-50 resin and lactic acid eluting agent is used; the flow rate is 10-25 ml. per hr. 10 ref. (C19; EG-g)

87-C. Consumable-Electrode Arc Melting of Titanium and Its Alloys. R. W. Huber and I. R. Lane, Jr. *U.S. Bureau of Mines, Report of Investigations* 5311, Feb. 1957, 36 p. (CMA)

A furnace for arc melting titanium and its alloys designed to allow for evacuating to very low pressures and back filling with inert gas for melting at about 1 atm. Vacuum melting was also tested in the furnace, using inert gas to sweep the crucible. The ingot prepared was rolled into plate and subjected to tensile and impact testing. The homogeneity of ingots of Ti-Al (1-7%), Ti-10Sn, Ti-5Sn, Ti5Al-2.5 Sn, Ti-Al-Fe, Ti-Al-Cr, Ti-Al-Mo and Ti-Al-V alloys was studied.
(C5h, 1-2; Ti)

88-C. Electrorefining Titanium Metal. J. R. Nettle, D. H. Baker, Jr., and F. S. Wartman. *U.S. Bureau of Mines, Report of Investigations* 5315, Feb. 1957, 43 p. (CMA)

Titanium has been successfully electrorefined in the laboratory by a fused-salt electrolysis with impure scrap or sponge as the anode; pure titanium is collected at the cathode. The cathode current density depends mainly on the amount of soluble titanium chloride in the electrolyte, but the condition of the anode is also influential. Several cells developed in the study are diagrammed and their operation discussed. A number of eutectic mixes of salts were surveyed for the fused bath. (C23p; Ti)

89-C. (French.) **Contribution to the Study of Rare Earths Separation by Ethylenediaminetetra-Acetic Acid.** J. Fuger. *Sociétés Chimiques Belges, Bulletin,* v. 66, no. 1-2, 1957, p. 151-168. (CMA)

It was found that the rare earths ytterium, europium, praseodymium, neodymium, promethium and cerium can be separated by elution with EDTA on a Dowex 50 column with careful pH control. For the more difficult separations, such as ytterium-europium, the optimum pH value is rather critical. Because of the low solubility of EDTA at the optimum pH for the separation of the yttric earths and their high stability with the complexone, they cannot be separated by this method. For the separation of lutecium, thulium, holmium, ytterium, terbium, gadolinium and europium it is suggested that a metallic complex of EDTA be used as the eluent on a Dowex column containing the same metal cation. 8 ref. (C28; EG-g)

90-C. (Book—French.) **Studies on Gallium With a View to Its Extraction During the Fabrication of Alumina.** 149 p. 1956. Imprimerie Vaudoise, Lausanne, Switzerland.

Methods of extracting gallium from the disaggregation lyes during the processing of alumina. Describes a new process, now in a pilot stage, for the extraction of gallium by electrolysis noting the different variables influencing the yield (temperature, current density, etc.). Includes also a bibliographical index listing over 1200 items. (C23p; Ga, Al)

91-C. Separation of Beryllium From Aluminum and Other Elements by an Extraction Method. J. P. Alimarin and I. M. Gibelo. *Journal of Analytical Chemistry of the USSR,* v. 11, July-Aug. 1956, p. 405-408. (Translation by Consultants Bureau, Inc., 227 W. 17th St., New York 11, N. Y.)

The extractability of acetylacetonates of aluminum, chromium, cobalt, iron, nickel, manganese, zinc, cadmium, lead, copper, calcium and magnesium by organic solvents (carbon tetrachloride, chloroform, n-butanol, and iso-amyl alcohol) in the presence of trilon B. 2 ref.
(C28; Be, Al)

92-C. Some Problems About Adding Zirconium Through $ZrCl_4$ to Magnesium Alloys. S. Morozumi. *Light Metals* (Tokyo), v. 7, Jan. 1957, p. 55-62. (CMA)

Problems in alloying magnesium with zirconium by adding zirconium tetrachloride considered. Losses of lanthanon and thorium constituents were investigated. The fused salt $ZrCl_4$-KCl-NaCl is more stable to heat and moisture than is $ZrCl_4$. Aluminum, silicon and iron inhibit the alloying of magnesium with zirconium and according to their amount, cause a loss of zirconium tetrachloride. Unalloyed zirconium goes to the bottom of the crucible as zirconium-rich particles.
(C5r; Mg, *Zr*, AD-n 32)

93-C. Electrolytic Titanium—II. R. S. Dean. *Metal Industry,* v. 90, Mar. 1, 1957, p. 165-167. (CMA)

Electrode potentials show that the alpha phase of titanium is less noble than the beta phase. Oxygen in titanium-oxygen may thus be anodically dissolved, leaving the metallic alloys in the beta phase. An example of this refining technique is given. Methods of preparing the electrolyte for this process, electrolyte maintenance and anode preparation are described. Aluminothermic reduction on a large scale is probably more practical for titaniferous ores and slags than Kroll reduction. Sorel slag readily forms a titanium-aluminum-iron alloy which is easily separated from oxide products after reduction. 4 ref. (C23p; Ti)

94-C. Recovery of Uranium From Magnesium Fluoride Volatility. G. I. Cathers and D. E. Ferguson. Paper from "Processing of Uranium-Magnesium Floride Slag", *U. S. Atomic Energy Commission,* TID-7528 (Pt. 1), Dec. 1956, p. 37-43.

It was found that reaction of magnesium fluoride slag with elemental fluorine at 400° C. volatilized 99% of the contained uranium, provided that good gas-solid contact was obtained. (C19r, B23; U, RM-q)

95-C. Separation of Niobium and Tantalum—Literature Survey. Ernest L. Koerner and Morton Smutz. Iowa State College. *U. S. Atomic Energy Commission,* ISC-793, Aug. 15, 14 p. ($15 from U. S. Office of Technical Services.)

Consolidation of the more important information available in the literature on the separation of columbium and tantalum, but only references which appear to have the most usefulness for future endeavors are included. 42 ref. (C28; Cb, Ta)

96-C. Carbonate Leach Recovery Process. R. G. Werkema. Paper from "Processing of Uranium-Magnesium Fluoride Slag", *U. S. Atomic Energy Commission,* TID-7528 (Pt. 1), Dec. 1956, p. 13-36.

A process for recovering uranium from a magnesium fluoride slag by means of carbonate leaching. A detailed analysis of the operating variables in this process as determined in pilot plant operation. (C19n, B23; U, RM-q)

97-C. Recovery of Uranium From Magnesium Fluoride Wastes by Ion Exchange. I. R. Higgins. Paper from "Processing of Uranium-Magnesium Fluoride Slag", *U. S. Atomic Energy Commission,* TID-7528 (Pt. 1), Dec. 1956, p. 44-53.

Ion exchange flowsheet for the recovery and partial purification of uranium based on the sorption of uranyl ion as a chloride complex on anion resin and its elution with water. 7 ref. (C19s, B23; U, RM-q)

98-C. Recovery of Uranium From Sulfate Residues of Magnesium Fluoride Slag. E. R. Johnson, R. L. Doyle, E. O. Rutenkroger and T. F. Rupert. Paper from "Processing of Uranium-Magnesium Fluoride Slag", *U. S. Atomic Energy Commission,* TID-7528 (Pt. 1), Dec. 1956, p. 54-80.

Studies designed to determine the relative merits of precipitating the uranium from sulphuric acid leach liquors of the sludge as (1) an ammonium diuranate-type compound, (2) uranous phosphate, (3) uranyl ammonium phosphate, and (4) peruranic acid. 6 ref. (C19n, B23; U, RM-q)

99-C. Progress Report on Separation and Recovery of Uranium and Thorium From Sulfate Liquors by the AMEX Process. D. J. Crouse, K. B. Brown and W. D. Arnold. Oak Ridge National Laboratory. *U. S. Atomic Energy Commission,* ORNL-2173, Jan. 11, 1957, 37 p.

The amine extraction (Amex) process can be used effectively for the extraction and separation of uranium and thorium from sulphate liquors in which these metals coexist. With proper choice of reagents, either uranium or thorium can be extracted first and the other extracted in a second cycle. Reagent costs are estimated to be low for both the uranium and thorium recovery cycles. (C19; U, Th)

100-C. Progress Report: Further Studies of the Dialkylphosphoric Acid Extraction (DAPEX) Process for Uranium. C. A. Blake, D. J. Crouse, C. F. Coleman, K. B. Brown and A. D. Kelmers. Oak Ridge National Laboratory. *U. S. Atomic Energy Commission,* ORNL-2172, Jan. 23, 1957, 113 p.

Progress is reported on certain aspects of the Dapex process, including further study of miscibility modifiers for the kerosene diluent, synergistic extractant combinations, stripping of extracted uranium, and continuous countercurrent demonstration on actual plant liquors. (C19; U)

101-C. Preparation of Ingots of U-Nb Alloy. O. N. Carlson, N. Ida,

D. Peterson, F. Tate and H. A. Wilhelm. Paper from "Metallurgical Information Meeting, Ames Laboratory", May 1956. *U. S. Atomic Energy Commission,* TID-7526 (Pt. 1), Feb. 1957, p. 28-33.

A study was made of the preparation of a uranium alloy with 10% Cb by the bomb co-reduction of uranium tetrafluoride and a suitable form of columbium with calcium. A composition close to Na_2CbOF_5 proved to be most satisfactory as the source of columbium. (C26; U, Cb)

102-C. Preparation of Boron-Containing Alloys. A. P. Beard, J. W. Harrison and C. J. Beck. Paper from "Metallurgical Information Meeting, Ames Laboratory", May 1956, *U. S. Atomic Energy Commission,* TID-7626 (Pt. 1), Feb. 1957, p. 115.

Stainless steel base alloys with nominal compositions of 18% chromium, 14% nickel and 0.4 to 3.2% boron were successfully cast into ingots by vacuum induction melting. (C5j, 1-23; SS, *B*)

103-C. Aluminum-Boron and Aluminum-Uranium-Boron Alloys for Improved Reactor Performance. W. C. Thurber, J. A. Milko and R. J. Beaver. Paper from "Metallurgical Information Meeting, Ames Laboratory", May 1956. *U. S. Atomic Energy Commisssion,* TID-7526 (Pt. 1) Feb. 1957, p. 116-128.

The problems associated with melting and casting homogeneous aluminum and aluminum-uranium alloys with borides of aluminum and nickel are reviewed. The results reported include pertinent physical and corrosion properties of these alloys; extent of segregation; irradiation testing program; and manufacturing procedures established for incorporation of boron into aluminum fuel elements. (C5, P general, R general, T11g, 2-17; Al, U, *B*)

104-C. (French.) **Preparation and Properties of Rare-Earth Metals.** Felix Trombe. *Chimie et Industries,* v. 77, Feb. 1957, p. 277-288. (CMA)

Two principal methods of preparing rare earth metals are briefly described: (1) electrolysis of molten salts, sometimes (for elements beyond neodymium) using a metal of low melting point as a cathode, in which the rare earth metal dissolves and which is subsequently distilled off; (2) substitution of the rare earth in a salt by another, more electropositive, metal, such as calcium. Certain differences in the properties of rare earths are pointed out; specific volume anomalies of cerium, both at high pressures and at low temperatures; the ferromagnetic behavior of gadolinium, dysprosium and erbium; and the antiferromagnetic properties of dysprosium at 180° K.
(C23p, C27, P general; EG-g)

105-C. (French.) **Electrolytic Cell for High Temperatures.** G. Chauvin, H. Coriou and J. Hure. *Metaux-Corrosion-Industries,* v. 32, Jan. 1957, p. 10-17.

Description of the construction and operation of a cell designed for the electrolytic preparation of zirconium. 13 ref. (C23, 1-2; Zr)

106-C. (German.) **Progress Realized in the Continuous Casting of Tin Bronzes.** E. C. Ellwood. *Giesserei,* v. 44, Feb. 28, 1957, p. 121-128.

Processes and apparatus for continuous casting of semifinished products for rolling mills.
(C5q; Cu-s, *Sn*)

107-C. (Italian.) **Developments in the Technique of Melting Light Alloys.** *Alluminio,* v. 26, Feb. 1957, p. 77-79.

Problem of avoiding inclusions, either gaseous or solid, in castings; origins of imperfections. Review of methods and equipment, with description of modern liquid and gas-fired furnaces, electric induction furnaces, reverberatory furnaces; advantages and problems with use of newer types of melting equipment.
(C5, W18; EG-a39, 9-19)

108-C. (Japanese.) **Studies on Electrolytic Refining of Aluminium at Low Temperature in Aluminium Chloride Baths (Part 12). Effect of Lead Chloride on the Electrodeposit of Aluminium and Crystal Structure of the Latter.** Rinzo Midorikawa. *Chemical Society of Japan, Journal,* v. 24, Dec. 1956, p. 562-567.

The addition of lead chloride is effective in improving the state of the electrodeposit. Crystal structure of the aluminum electrodeposits investigated by the X-ray diffraction method. 16 ref. (C23p, N12d; Al)

109-C. Some Aspects of the Physical Chemistry of Hydrometallurgy. J. Halpern. *Journal of Metals,* v. 9, Feb. 1957, p. 280-289.

Evaluation of various thermodynamic and kinetic factors influencing hydrometallurgical processes. Specific leaching and precipitation reactions are discussed in detail. 65 ref. (C19n, P12)

110-C. Ferromanganese From Low-Grade Ores. J. J. Burke. *Journal of Metals,* v. 9, Mar. 1957, p. 340-342.

Description of Udy process for production of ferromanganese and iron from ores which average only 12 to 13% manganese and 15 to 20% iron. Process depending on melting in reverberatory furnace and selective reduction in three electric furnace stages shows economic promise.
(C21c, C21d; Fe, Mn, AD-n)

111-C. Cobalt Pressure Leaching and Reduction at Garfield. J. S. Mitchell. *Journal of Metals,* v. 9, Mar. 1957, p. 343-346.

Principal steps in cobalt recovery from arsenical concentrates are auto-oxidation, acid leaching under pressure, filtration of tailings, purification of solution, hydrogen reduction of ammoniacal solution and melting in an electric arc furnace.
(C19n, C26, C21d; Co)

112-C. (Book.) **Processing of Uranium-Magnesium Fluoride Slag—Technical Information Meeting, Dec. 6, 1956.** Oak Ridge Operations Office, *U.S. Atomic Energy Commission,* TID-7528, Pt. 1, Dec. 1956, 80 p.

Papers abstracted separately.
(C general, B23; U, RM-q)

113-C. Zone Melting of Uranium. C. I. Whitman, V. Compton and R. B. Holden. *Electrochemical Society Journal,* v. 104, Apr. 1957, p. 240-244.

A study of the possible application of the zone melting technique to the separation of uranium from fission products and other impurities. Bar specimens of uranium having various alloying elements were zone purified in thoria-coated alumina boats. Uranium bars previously irradiated in the Brookhaven pile were also zone melted. Zone melting has potential application in the removal of such impurities as boron, iron, silicon, nickel and cobalt from ordinary uranium. 6 ref. (C28k; U)

114-C. Purification of Plutonium by a Thenoyltrifluoro-Acetone (T.T.A.) Process. J. G. Cuninghame and G. L. Miles. *Journal of Applied Chemistry,* v. 7, Feb. 1957, p. 72-81.

Extraction of plutonium by thenoyltrifluoro-acetone in the presence of impurities discussed and data presented for the extraction of uranium, zirconium, ruthenium, iron and chromium. A block flow-sheet for the purification of 1 g. of plutonium from 10 g. of uranium and one curie of zirconium is given.
(C19; Pu, U, Zr)

115-C. Electrolytic Titanium—Pt. III. R. S. Dean. *Metal Industry,* v. 90, Mar. 8, 1957, p. 193-194. (CMA)

Equipment for conventional fused electrolysis is not suited to the process of the Chicago Development Corp. since titanium ion concentrations are low. The anode must be disposed around the cathode to provide the minimum diffusion path. Cells of different sizes and their performances are described. The cathode deposit comes as a thin plate, a layer of fine crystals and an outer dispersion of coarse crystals; most of the salt bath is easily removed. The titanium loss from solution into the salt bath is minimized by having a salt containing 5% soluble titanium. Anode loss depends on its composition. Operating conditions are prescribed. (C23p; Ti)

116-C. Fundamental Studies on Copper Smelting. Pt. V—Mutual Dissolution Between Matte and Slag Produced in System Cu_2S-FeS-FeO-SiO_2. Akira Yazawa. *Tohoku University, Technology Reports,* v. 21, no. 1, 1956, p. 31-50.

The separation of the melt into matte and slag is ascribed mainly to the existence of silica and cuprous sulphide, especially of silica. In an actual matte smelting furnace the matte-slag system contains lime, aluminum, etc., which decrease the mutual solubility in addition to the presence of comparatively large amounts of silica and cuprous sulphide, so that a perfect separation between slag and matte is always brought about in practice. 6 ref.
(C21; Cu)

117-C. (German.) **Refining of Gold Alloys Containing Palladium by Means of Pulsating Direct Current.** J. Steiner and O. Adlhart. *Metall,* v. 11, Feb. 1957, p. 113-116.

Under suitable electrolytic conditions not only the advantages of the pulsating direct current can be utilized, but also a lower palladium content of the cathodes can be obtained at the same current densities. 5 ref. (C23p; Au, *Pd*)

118-C. (Portuguese.) **Extraction of Zinc From Silicated Ores by Means of Hydrometallurgy.** Hugo Lodewijk Radino. *A B M, Bulletin of Brazilian Metals Society,* v. 45, Oct. 1956, p. 355-366.

Utilization of silicated zinc ores formerly prevented by formation of gelatinous siliceous acid which does not permit filtration of suspension of lixiviated ore. New patented lixiviation process eliminates this difficulty. 5 ref. (C19n; Zn, RM-n)

119-C. (Russian.) **Metal-Reduction Methods in Chemistry and Technology.** G. V. Samsonov and Yu. D. Chistyakov. *Uspekhi Khimii,* v. 25, Oct. 1956, p. 1223-1248.

Work on the reduction of metals and some nonmetals (silicon) with metals is reviewed. Reference is made to the use of metal hydrides as reducing agents in processes of this type. The physico-chemical aspects of the processes involved are discussed in detail. (C26)

120-C. (Russian.) **Separation and Purification of Elements by the Rectification Method. Pt. I. Separation of Zirconium From Hafnium by the Distillation of the Products of the Interaction of Their Tetrachlorides With Phosphorus Oxychloride.** L. A. Nisel'son and M. I. Kalinin. *Zhurnal Neorganicheskoy Khimii,* v. 1, Dec. 1956, p. 2657-2669.

Selection of the right type of column is of importance so the separation of these two elements by distillation may be successfully accomplished. The experimental results demonstrate that the distillation can be efficiently conducted in a column with perforated plates. (C22h; Zr, Hf)

121-C. Refractories for Melting and Casting Uranium and Other Metals. S. D. Stoddard and W. T. Harper. *American Ceramic Society Bulletin,* v. 36, Mar. 1957, p. 105-108.

The various pure oxide refractories employed in melting and casting uranium, uranium alloys and other metals; purity of the refractories and their methods of fabrication; coating materials and methods of applying them to molds and crucibles; a typical vacuum furnace installation for melting uranium alloys; details of the various furnace refractory components and their fabrication methods. (C5; U, RM-h)

122-C. Pilot Plant Testing of Uranium Ores at the Mines Branch, Ottawa. W. A. Gow, H. W. Smith and R. Simard. *Canadian Mining and Metallurgical Bulletin,* v. 50, Mar. 1957, p. 128-133. (*Transactions,* v. 60, 1957, p. 70-75.)

Description of acid leach pilot plant involving feed preparation, leaching and solution recovery for testing suitability of treatment process for uranium ores. (C19n; U)

123-C. Studies on Electro-Refining of Silver. G. C. Mitter. *Indian Institute of Metals, Transactions,* v. 8, 1954-55, p. 15-34.

Several methods of silver electrorefining; new processes and mechanisms of reaction. (C23p; Ag)

124-C. Titanium Metallurgy—I. Announce Method for Reduction of Titanium Chloride by Solutions of Alkalinious Metals in Their Fused Salts. R. S. Dean, W. W. Gullett, F. X. McCawley and I. Hornstein. *Industrial Laboratories,* v. 8, Apr. 1957, p. 4-7. (CMA)

Titanium can be formed electrolytically from a fused bath of alkali chloride and titanium chloride at cell voltages below the decomposition potential of the alkali chloride. These supersaturated solutions from which titanium crystallizes are most simply formed by electrolysis in a diaphragm cell. The anodic potential of the titanium electrode has been determined in an H cell of Ag/AgCl/$TiCl_{2-3}$/LiCl/KCl composition; the cell potential was constant at 0.70 v. at 100 ppm. of $TiCl_2$, yielding 1.75 v. for the anode potential. The crystals may also be produced by direct addition of sodium and titanium chloride. 14 ref. (C23p; Ti)

125-C. Commercial High-Purity Titanium and Titanium Alloys. H. Kusamichi, Y. Yagi and T. Yukawa. *Japan Institute of Metals, Journal,* v. 21, Jan. 1957, p. 1-10. (CMA)

A comparative study of the consumable electrode and nonconsumable electrode, arc melting furnaces for titanium alloys was conducted; capacities were 50 lb. and 1 lb., respectively. Cast ingots of sound internal structure are produced by consumable electrode arc melting. The alternative method has less thermal efficiency, produces internal defects in the ingot and contaminates the ingot with tungsten unless the electrode tip is water-cooled. Supersonic inspection was adopted. (C5h; Ti-a)

126-C. Evaluation of the Hafnium Melting, Forging, and Rolling Work Conducted by the Crane Co. D. N. Dunning. *U.S. Atomic Energy Commission,* KAPL-M-DND-2, Jan. 22, 1957, 21 p. (CMA)

Hafnium ingots may be produced by the consumable melting procedure but some difficulty may be en-

countered. All ingots were contaminated by copper with the procedures used, and erratic arcs were noted. A full starter plate bolted to the crucible bottom with a hafnium stud was adopted to eliminate arcing problems and a vacuum was maintained throughout; the ingots were thus improved. The forging and rolling procedures described are satisfactory. (C21d, F22, F23; Hf)

127-C. Digestion and Filtration of Leached Zone in Pilot Plant. Gordon L. Dugger, J. B. Adams and Roger Bart. International Minerals and Chemical Corp. *U.S. Atomic Energy Commission,* RMO-2044, Feb. 28, 1955, 35 p.

Study of the recovery of three products, tri-uranium octa-oxide (U_3O_8), phosphoric anhydride (P_2O_5) and alumina (Al_2O_5) from the 200-mesh fraction of the leached zone in the Florida phosphate field. (C19n; U, Al)

128-C. The Preparation of Large-Diameter Zirconium Crystal Bar by the De Boer Process. H. H. Bulkowski, et al. *U.S. Atomic Energy Commission,* BMI-523, Mar. 6, 1951, 17 p. (CMA)

Work with a conventional, large-diameter de Boer apparatus has shown that zirconium crystal bar of large diameter may be produced. Bar averaging 1.62 in. diameter can be produced with a power consumption of 60-90 kw. per hr. per lb., slightly more than for bar of smaller diameter. The unit was constructed of Hastelloy B. (C28, 1-2; Zr)

129-C. Consumable Electrode Arc-Melting of Cold Compacted Thorium Powder. R. Witt. Sylvania Electric Products, Inc. *U.S. Atomic Energy Commission,* SEP-209, Apr. 19, 1956, 28 p.

The consumable-electrode arc melting of cold compacted thorium powder has been developed to produce dense, clean and soft ingots which can be hot rolled without cracking. The relationship of specific variables such as power at the arc, crucible size, electrode size and argon pressure have been determined relative to minimum requirements to obtain sound ingots. (C5h; Th, 6-23)

130-C. Hydrofluorination of Zirconium Oxide. Don Phillips. *U.S. Atomic Energy Commission,* AECD-4054, Aug. 2, 1950, 5 p. (CMA)

Calcium reduction of zirconium tetrafluoride has shown promise as an approach to pure ductile zirconium, and therefore the hydrofluorination of ZrO_2 to produce ZrF_4 was studied on a small scale. The sample for hydrofluorination must be free of carbon. A study of reaction time and temperature showed that at least 2 hr. at 700° C. is necessary. The most demanding conditions for complete reaction were 4 hr. at 800° C. The effect of adding hydrogen to the inert atmosphere employed is noted. (C1p; Zr)

131-C. Percolation Leaching of Manganese Ores With Sulfur Dioxide. F. N. Bender and Carl Rampacek. *U.S. Bureau of Mines,* Report of Investigations 5323, Mar. 1957, 20 p.

Percolation leaching of wad-type manganese ores was investigated, using a novel system of alternate upward passage of sulphur dioxide gas through moistened ore and downward percolation of wash solutions to extract solubilized manganese. (C19n; Mn, RM-n)

132-C. Titanium Sponge Production Methods and Present Status. J. L. Gissy, G. H. Schipperit and J. G. Kura. Battelle Memorial Institute. *U.S. Office of Technical Services,* Report 52. PB 121620, Sept. 1956, 32 p. (CMA)

Discussion of raw materials used in titanium sponge processing includes ores and the use of ilmenite. Chlorination, purification and reduction phases are covered, merits and demerits of the sodium reduction and Kroll processes are noted. A list of domestic and foreign producers is given. (C26; Ti, RM-n, 6-24)

133-C. (German.) **High-Vacuum Smelting of Uranium.** Heinz E. Schimmelbusch and Heimo Hardung-Hardung. *Atom Praxis,* v. 3, no. 1, 1957, p. 11-14.

Smelting in suitable crucibles, ingot casting at high vacuum; smelting in high-vacuum arc furnaces using self consuming uranium electrodes. (C25; U)

134-C. (German.) **The Amalgam Metallurgy of Titanium.** H. Hohm, E. Fitzer and H. Hofbauer. *Berg- und Huetenmannische Monatshefte,* v. 101, Dec. 1956, p. 277-285. (CMA)

The authors experimented with the possibilities of the reduction of titanium tetrachloride by amalgams and obtained results encouraging enough to envisage a procedure of

continuous smelting of titanium sponge. The reaction mass is separated into two liquid phases: metal and a slag of salts. The latter is made sufficiently fluid by obtaining a eutectic composition through a just apportioning of the amalgams of sodium and calcium. The procedure consists of (1) the reaction between $TiCl_4$ and $Ca_xHg + Na_xHg$, whereby $TiHg + Hg$ and the slag $NaCl + CaCl_2$ are formed; (2) filtration, whereby TiHg and Hg (90%) are separated; (3) distillation, when Hg (10%) is eliminated from the titanium sponge; and (4) recovery of sodium and calcium through the electrolysis of the chlorides. 16 ref. (C29; Ti)

135-C. Vacuum Melting and Annealing. Roger Giler. *Metal Treating,* v. 8, Mar-Apr. 1957, p. 14-16, 60.

Applications and benefits of vacuum treatment; furnace types. Vacuum induction melting, vacuum arc melting and vacuum heat treating. (C5h, C5j, I-23, D8m, J2n, 1-2)

136-C. How and Why of Pressure Leaching and Precipitation Processes. Frank A. Forward. *Mining Congress Journal,* v. 43, Apr. 1957, p. 112-116.

An appraisal of pressure hydrometallurgical processes which examines principles involved, potential applications, and the feasibility of conducting operations of this type successfully on a practical basis. (C19n, B14, 3-24)

137-C. Resin-in-Pulp Method for Recovery of Uranium. R. F. Hollis and C. K. McArthur. *Mining Engineering,* v. 9, Apr. 1957, p. 442-449.

Five U.S. commercial uranium ore-processing plants now in final design or under construction incorporate this process. Dissolved uranium is recovered from acid-leached pulps by strong base anion exchange resins. (C19s; U)

138-C. Purification of Mercury and Its Physical Properties. Charles L. Gordon and Edward Wichers. *New York Academy of Sciences, Annals,* v. 65, Apr. 11, 1957, p. 369-387.

Principal procedures that have been used for purifying mercury; recommendations of the modifications of these procedures that have been found most convenient and useful; review of suitable criteria of purity for the metal, and tabulation of values for most of its important physical properties. 59 ref. (C general, P general; Hg)

139-C. Homogeneous Alloy Ingots Produced by Consumable-Electrode Arc Melting. R. A. Beall, F. Caputo and E. T. Hayes. Bureau of Mines, Report of Investigations 5200. *U.S. Office of Technical Services,* PB 123755, Mar. 1956, 14 p. (CMA)

Homogeneous zirconium alloy ingots of high specifications were made by consumable electrode arc melting in water-cooled copper crucible. Zirconium alloy bars were pressed from sponge semi-continuously with periodic alloying addition. Magnetic stirring improved ingot homogeneity. Double melting is required for uniform alloy distribution and complete gas removal. Alloying additions in the form of tin wire in bars were unsuccessful. (C5h, C5r; Zr)

140-C. Electrochemical Preparation of Boron. Nelson F. Murphy, Richard S. Tinsley and George F. Meenaghan. *Virginia Polytechnic Institute, Bulletin,* v. 50, Feb. 1957, p. 3-18.

Electrolysis of the sodium oxide-sodium borofluoride-boron oxide molten salt bath at about 800 to 850° C.; 1.0 amp. per sq. cm. using iron cathode and graphite rod anodes is recommended as a new method for preparation of elemental boron. 26 ref. (C23p; B)

141-C. (German.) **Magnesium and Its Casting Alloys.** K. Sautner. *Metall,* v. 11, Mar. 1957, p. 196-201.

Occurrence; preparation by electrolysis of dehydrated carnallite, artificial (recrystallized) carnallite, synthetic carnallite, chlorination of magnesium oxide; preparation from sea water by precipitation with lime water or dolomite; other preparation methods, application of magnesium alloys. (C general, T general; Mg, 5)

142-C. (German.) **Formation Mechanism of Mercury-Free Alloys During Amalgam Reactions.** Franz Lihl and Herbert Kirnbauer. *Zeitschrift für Metallkunde,* v. 48, Feb. 1957, p. 61-66.

Amalgam process for the preparation of mercury-free alloys at temperatures between 200 and 400° C. Classification of amalgams and reactions under different conditions. Mechanism of alloy formation in mercury; thermodynamic equilibria of the mercury-free alloys and conditions for the application of the amalgam process. 2 ref. (C29)

143-C. (Italian.) **Electrolytic Refining of Lead in the Plant of S. Gavino Monreale.** E. Freni. *Metallurgia Italiana,* v. 49, Feb. 1957, p. 107-123.

Results obtained in a pilot plant (three tons daily capacity) allowed a direct comparison between the classic method and the new refining process with full advantage for the latter, particularly when bismuth-bearing lead is treated. 22 ref. (C23p; Pb)

144-C. (Italian.) **Fluoride-Chloride Baths for Electrolysis of Alumina.** A. Vajna. *Metallurgia Italiana,* v. 49, Feb. 1957, p. 124-126.

Investigation of some chemical and physical properties of fluoride-chloride baths for the electrolysis of alumina with regard to their possible application in industrial cells of conventional type. 3 ref. (C23p; Al)

145-C. Mechanism of Titanium Production by Electrolysis of Fused Halide Baths Containing Titanium Salts. J. G. Wurm, L. Gravel and R. J. A. Potvin. *Electrochemical Society, Journal,* v. 104, May 1957, p. 301-308. (CMA)

Electrolytic titanium from a molten KCl-NaCl bath containing K_2TiF_6 and Na_2TiF_6 is produced by two steps: reduction of $TiCl_4$ to trivalent double fluorides and reduction of these to titanium metal. The trivalent double fluorides are of the type K_2NaTiF_6. Diagrams of the electrolytic cells are shown. (C23p, 1-3; Ti)

146-C. Sodium Process Extracts Titanium in Commercial Tonnages. J. Milton. *Iron Age,* v. 179, May 9, 1957, p. 120-122. (CMA)

The sodium process for producing titanium granules is employed by Electro Metallurgical Co. (Ashtabula) and General Chemicals Division of ICI (Wilton, England). The problem of the explosiveness of sodium has been overcome and oxygen contamination eliminated. The titanium granules may be mixed with alloying additions in a double cone mixer and then compacted by rotary pellet machines. The block formed serves as a consumable electrode in arc melting. The cast ingots are then dressed to remove blemishes. (C1p, C5h; Ti)

147-C. Controlling Rare-Earth Separations by Means of Varying Resin Column Operating Temperatures. D. C. Stewart. *Journal of Inorganic and Nuclear Chemistry,* v. 4, Mar. 1957, p. 131-133. (CMA)

Ion-exchange columns tend to broaden and isolate absorption bands more in the lanthanons later eluted than in those earlier eluted. A "gradient elution" technique has been developed which entails the gradual increase of the pH of the elutriant and a cooling in the 93-25° C. range. Separation time is shortened and the peaks are uniformly spaced. (C19s; EG-g)

148-C. Electrolytic Refining of Titanium. R. S. Dean. *Light Metal Age,* v. 15, Apr. 1957, p. 20-22. (CMA)

The titanium electrorefining process of Chicago Development Corp. is discussed. $TiCl_{2-3}$ produced at the anode and alkali metal solution at the cathode react to form titanium particles. The oxygen dissolved in the alloy is converted to TiO_2 and remains as an anodic residue. An analytical evaluation of electrolytes showed that NaCl-2.5% $TiCl_{2-3}$ is superior. The reaction equilibria, alloy behavior above the beta transus, anodic behavior versus cathode deposit structure, and preparation of the electrolyte and anode were studied. (C23p; Ti)

149-C. Melting Metals in Vacuum-Arc Furnaces. W. J. Kroll. *Metal Treatment and Drop Forging,* v. 24, Apr. 1957, p. 162-168. (CMA)

The vapor pressure-temperature curve of titanium is considered in relation to vacuum-arc melting. Vigorous stirring is necessary to keep the temperature differences in the bath small and to minimize the separation of alloying additions. When degasifying or deoxidizing in vacuo a low dynamic air pressure is necessary to keep the metal from volatilizing. Consumable electrode melting in vacuo is not suitable for degasifying, but an open electrode-arc furnace with two electrodes is satisfactory. The glow discharge phenomenon in vacuum-arc melting is described; it depends mainly on the pressure-voltage function. Problems with degassing titanium sponge and scrap and of hydrogen removal are discussed. A helium-argon shield controls the arc well except with hydrogen-rich sponges. (C5h, 1-23; Ti)

150-C. Arc Properties in the Five Rare Gases. H. S. Morton and R. M. Gage. Paper from "Arcs in Inert Atmospheres and Vacuum", Electrochemical Society. (John Wiley & Sons, Inc.), p. 8-18.

Voltage-current and voltage-arc length relationships are presented,

calorimetric data are given, and some effects of the self-induced arc jet are discussed.
(C5h, X10, 1-2; EG-m43)

151-C. Characteristics of Consumable Electrode D. C. Arcs in Argon, Helium and Vacuum. E. W. Johnson, G. T. Hahn and Robert Itoh. Paper from "Arcs in Inert Atmospheres and Vacuum", Electrochemical Society. (John Wiley & Sons, Inc.), p. 19-40.

Arcs were struck in 1 atm. argon between horizontal electrodes of steel, titanium, molybdenum, tungsten and graphite, and also between a molten pool and a vertical cathodic electrode of iron or steel at inert gas pressure between 200 and 0.02 mm. Hg. 4 ref.
(C5h, T1f, 17-7; EG-m43)

152-C. Effect of Variables on the Melting Rate of Metals in the Consumable Electrode Arc Furnace. W. H. Smith. Paper from "Arcs in Inert Atmospheres and Vacuum", Electrochemical Society. (John Wiley & Sons, Inc.), p. 41-56.

Melting rates of copper, iron, titanium and molybdenum determined as functions of the following variables: kind of metal, crucible to electrode size ratio, power input, melting pressure, and type of electrical circuit. 6 ref.
(C5h, W18s, 1-2; Cu, Fe, Ti, Mo)

153-C. Effects of Magnetic Stirring on Titanium Ingot Quality. D. E. Cooper and R. J. Krieger. Paper from "Arcs in Inert Atmospheres and Vacuum", Electrochemical Society. (John Wiley & Sons, Inc.), p. 57-68.

Effect of stirring on surface porosity and as-cast grain structure was observed and concluded that optimum degree of magnetic stirring was desirable from the standpoint of ingot quality. (C5; Ti)

154-C. German Developments in the Vacuum Arc Melting of Titanium and Zirconium. Helmut Gruber. Paper from "Arcs in Inert Atmospheres and Vacuum", Electrochemical Society. (John Wiley & Sons, Inc.), p. 118-148.

Control, stabilization problems and safety measures. Furnace producing 1000-lb. ingots of titanium or zirconium at about 40 tons per year was the largest used in the investigations.
(C5h, 1-23, W18s, 1-2; Ti, Zr)

155-C. Energy Transfer in the High Intensity Arc. Pt. I. A Steady State Treatment of Endothermic Processes Near the Anode Surface. Pt. II. Qualitative Theory of the Anode Sheath. Marilyn Alder Marquis, Laurence Mead, Samuel Korman and Charles Sheer. Paper from "Arcs in Inert Atmospheres and Vacuum", Electrochemical Society. (John Wiley & Sons, Inc.), p. 149-168.

Equations describing matter and energy balance of the anode flame are derived. Effects of variation in power input, anode consumption rate, and ambient pressure on local temperature and matter density of the anode flame are examined and compared with experimental observations. Rapid vaporization of anode material is explained and a tentative explanation given of subsequent superheating of anode vapor. 18 ref. (C5h)

156-C. The High Intensity Arc in Process Chemistry. Charles Sheer and Samuel Korman. Paper from "Arcs in Inert Atmospheres and Vacuum", Electrochemical Society. (John Wiley & Sons, Inc.), p. 169-183.

Applications to ore reduction in inert atmosphere and vacuum, halogenation and other chemical reactions. Refractory materials, as consumable electrodes, can be vaporized, reacted in homogeneous phase, and condensed, without contacting furnace walls, at power consumption of 4 to 7 kw-hr. per lb.
(C21d, 1-23, W18s, 1-2)

157-C. (German.) **Zirconium-Containing Magnesium Alloys With Added Zinc, Cerium and Thorium—Their Preparation and Melting Technique.** Joseph Dornauf. *Zeitschrift für Metallkunde,* v. 28, Mar. 1957, p. 142-145. (CMA)

Zirconium in magnesium alloys has the beneficial property of reducing the grain of the alloy, which increases the mechanical strength of the alloy. However, there is an incompatibility between zirconium and the two important components of magnesium alloys, aluminum and manganese. In the presence of either of these metals zirconium tends to precipitate from the solution in magnesium. It has been found that this can be avoided by substituting zinc, cerium or thorium for aluminum, and that the function of manganese (elimination of iron) is satisfactorily performed by zirconium itself. The author describes the optimum compositions of Mg-Zn-Zr, Mg-Ce-Zn-Zr, Mg-Th-Zr and Mg-Th-Zn-Zr alloys, the mechanical

properties of these alloys, and the procedures for their preparation. 8 ref. (C general, Q general, 2-10; Mg, *Zr, Zn, Ce, Th*)

158-C. (Russian.) **Mechanism of Reduction of Oxides of Zirconium and Titanium With Calcium Hydride.** G. A. Meerson and O. P. Kolchin. *Atomnaya Energiya,* v. 2, Mar. 1957, p. 253-259. (CMA)

It has been an accepted view that in the reduction of metal oxides with calcium hydride it is the atomic hydrogen, generated through the dissociation of calcium hydride that performs the reduction. Selecting the reduction of zirconium and titanium oxides as appropriate examples, the authors examined the question both a priori and experimentally. Theoretically, they found that the decrease of free energy in the case of calcium reduction is larger than in the case of hydrogen reduction, the difference becoming still larger if the low equilibrium partial pressure of atomic hydrogen at the high temperature involved is taken into consideration. In the direct experimental study of the process comparison was made between the action of calcium hydride and metallic calcium, the latter being used either in the solid state or as a vapor. The reduction with the hydride in the atmosphere of argon was measured, and the process of "self-reduction" of titanium and zirconium hydride by their own hydrogen was examined. It was concluded that calcium plays the essential role in the reduction of oxides with calcium-hydride, that calcium vapors take an active part in the process and that hydrogen dissolved in the metal produced is able to perform a refining action in terminating the reduction of "impurity" oxides. 7 ref. (C26; Zr, Ti, *Ca,* 14-18)

159-C. Ion Exchange: Five Contributions to Nuclear Technology. L. D. Roland. *Atomics and Nuclear Energy,* v. 8, Apr. 1957, p. 131-135.

Five applications of the ion exchange method are: (1) uranium extraction, (2) uranium purification, (3) reactor water treatment, (4) zirconium purification, (5) waste disposal. (C19s, A8, W11p, 1-3)

160-C. Fundamental Research on the Port Pirie Lead Blast Furnace Slags. W. McA. Manson and E. R. Segnit. *Australasian Institute of Mining and Metallurgy, Proceedings,* v. 180, Dec. 1956, p. 119-147.

Thermodynamics and phase equilibrium relationships of some slag components; mineralogy of some dezinked slags and viscosity measurements. 9 ref.
(C21a, P10f; Pb, RM-q)

161-C. Continuous Vacuum Dezincing Plant at the B.H.A.S. Pty. Ltd., Port Pirie. R. Davey and K. C. Williams. *Australasian Institute of Mining and Metallurgy,* v. 180, Dec. 1956, p. 207-217.

Brief account of the plant which has been developed at Port Pirie to recover, by vacuum distillation, the greater part of zinc content of desilverized lead.
(C22h, 1-23; Zn, Pb)

162-C. Zone Refining of Impure Copper. E. D. Tolmie and D. A. Robins. *Institute of Metals, Journal,* v. 85, Jan. 1957, p. 171-176.

Process was applied to an alloy containing 0.01 % antimony, chromium, cobalt, iron, manganese, nickel, silicon, silver and tin. All the added elements segregated in the direction of travel of the molten zone with the exception of iron, cobalt and nickel which segregated in the reverse direction. Experimental results with a mathematical expression were used to calculate effective partition coefficients for the various impurity elements. (C28k; Cu, 9-1)

163-C. The Development of Iodide Process of Refining Titanium and Zirconium. R. A. J. Shelton. *Metallurgia,* v. 55, May 1957, p. 225-231. (CMA)

The debt of the iodide processors of titanium and zirconium to workers in the incandescent lamp field is noted. Apparatus used in the van Arkel process for titanium or zirconium of high purity consists of the glass reaction bulb, a molybdenum grid, tungsten filaments and iodine reservoir and a pumping system. A general discussion of work with incandescent filaments is appended. (C1p, 1-2; Ti, Zr)

164-C. Zone Melting: a Physical Method for Controlling Impurities in Metals. Douglas H. Polonis. *Trend in Engineering at the University of Washington,* Apr. 1957, p. 23-27.

Principles of zone melting; effect of single and repeated pass zone refining; applications of zone refining. 8 ref. (C28k; 9-1)

165-C. Electrowinning Chromium Metal. J. B. Rosenbaum, R. R. Lloyd and C. C. Merrill. *U.S. Bureau of Mines, Report of Investigations* 5322, Mar. 1957, 58 p.

Two separate systems for electrolytic chromium recovery were developed, one designated as the oxidized system and the other as the reduced system. (C23n; Cr)

166-C. On the Anhydrous Reduced Halides of Zirconium and Hafnium. E. M. Larsen and J. L. Leddy. University of Wisconsin. Technical Report IX, under Contract N7 onr-2850, *U.S. Office of Technical Services,* PB 124956, Aug. 1955, 22 p. (CMA)

Halogenizing zirconium or hafnium to the trihalide by exposing them to the tetrahalide of the metal was studied with regard to reaction times vs. extent of reaction. Higher temperatures favor trihalide production in the range 200-700° C. Increasing the pressure has a similar effect. Iodides are more easily reduced than the lower halides, the tetrafluoride not being reducibile. Zirconium tetrahalides are slightly more reducible than hafnium tetrahalides. The reaction rate is appreciable only above 450° C. X-ray studies were used. (C19r; Zr, Hf)

167-C. (English.) **Extraction of Precious Metals From Production Wastes. Pt. I. Extraction of Metallic Gold From Production Wastes by Synthetic Resins.** A. B. Davankov and V. M. Laufer. *Journal of Applied Chemistry of the USSR,* v. 29, June 1956, p. 1037-1039. (Translated by Consultants Bureau, Inc., 227 W. 17th St., New York 11, N.Y.)

Synthetic resins used as adsorbents in the development of a new method for the extraction of metallic gold from industrial effluents. The best results in the extraction of gold in static and dynamic conditions were obtained with the use of highly porous resins. 4 ref. (C19a; Au)

168-C. (English.) **Method of Refining Silicon by Alloying.** Ichiji Obinata and Noboru Komatsu. *Tohoku University, Science Reports of the Research Institutes,* v. 9-A, Apr. 1957, p. 118-130.

For refining crude silicon, a new method consisting essentially of electrolysis of aluminum-silicon anode obtained by alloying crude silicon into molten aluminum is proposed. The principles of the method as well as the results of observations on the behavior of the impurities contained in the crude silicon during the process are described. (C23p; Si)

169-C. Chemical Treatment of Gold Slime for the Recovery of High Purity Gold and Silver. G. A. Walker. *Australasian Institute of Mining and Metallurgy, Proceedings,* no. 180, Dec. 1956, p. 21-54.

The ready solubility of gold in dilute aqueous solutions of the cyanides of the alkalis or alkaline earths provides a convenient method for the separation of the precious metal from the large surplus of associated material; treatment of gold slime, dissolution method, chlorination and gold precipitation. (C19p; Au, Ag)

170-C. Ammonia Pressure Leach Process Recovers Metals From Ore Concentrate. *Chemical & Process Engineering,* v. 38, Apr. 1957, p. 159, 160, 164.

An ammonia plant is integrated with the metal recovery plant whereby 75 tons per day of anhydrous ammonia can also be produced, based on natural gas. (C19n; RM-g31)

171-C. Now: Uranium Via Solvent Extraction. *Chemical Engineering,* v. 64, Apr. 1957, p. 149-150.

New process using sulphuric acid leach liquors; experience to date favors extraction over ion exchange. (C19; U)

172-C. Preparation of Pure U_3O_8 From Crude Sodium Diuranate by Intermediate Complex Formation. N. S. Krishnaprasad and V. V. Dadape. *Indian Academy of Sciences, Section A, Proceedings,* v. 45, Jan. 1957, p. 20-23.

Separation of uranium from various undesirable elements by solvent extractions and several other complexing procedures; uranium separation from thorium and rare earths. 7 ref. (C19; U, Th)

173-C. Continuous Casting. J. Lomas. *Machinery Lloyd,* v. 29, Mar. 1957, p. 95-97.

History, difficulties and advantages of continuous casting. (C5q, D9q)

174-C. RIP Recovers U_3O_8; Carbonate Leach for Ambrosia; Solvent Extraction Grows. H. L. Hazen. *Mining World,* v. 19, Apr. 15, 1957, p. 44-46.

Processing of uranium ore by the resin-in-pulp method (RIP); the process recovers dissolved uranium from acid slime pulp by adsorption on anion exchange resin leads. (C19s; U)

175-C. Development of the Extraction Process for Uranium From South African Gold Uranium Ores. A. M. Gaudin, R. Schuhmann and John Dasher. *South African Institute of Mining and Metallurgy, Journal,* v. 57, Dec. 1956, p. 287-304.

Extraction of uranium from pregnant liquor by precipitation and ion exchange resins. The complete process of gold and uranium recovery is shown. 13 ref. (C19; Au, U)

176-C. Fission Product Separation From Thorium-Uranium Alloy by Arc-Zone Melting. R. D. Burch and C. T. Young. Atomics International, *U.S. Atomic Energy Commission,* NAA-SR-1735, Apr. 15, 1957, 23 p.

Investigation to determine the feasibility of removing fission products from irradiated thorium-uranium alloys by using a zone-melting process. This process utilizes an electric arc to maintain the molten zone. Radiochemical analyses of the processed alloys indicated that uranium, tellurium, zirconium and ruthenium were successfully moved in the direction of zone travel, and that some of the fission products were removed during processing by volatilization. (C28k, 2-17; Th, U)

177-C. (French.) **On the High-Purity Refining of Uranium by the Zone Melting Process.** Philippe Albert, Omourtague Dimitrov, Jacques Héricy and Georges Chaudron. *Comptes Rendus,* v. 244, Feb. 18, 1957, p. 965-970.

Experiments and highly successful results described. 4 ref. (C28k; U)

178-C. (French.) **On the High-Purity Refining of Iron by the Zone Melting Process.** Jean Talbot, Philippe Albert and Georges Chaudron. *Comptes Rendus,* v. 244, Mar. 18, 1957, p. 1577-1579.

Pure electrolytic iron reveals new properties, particularly aptitude for permitting phenomenon of polygonization. 4 ref. (C28k; Fe)

179-C. (French.) **Processing of Uranium Ores.** J. E. Leger. *L'Industrie Chimique,* v. 44, Mar. 1957, p. 67-71.

French uranium deposits; organization of plant, process principles, equipment required to produce uranium products, all with reference to plant built by Ets. Kuhlmann for "Société Industrielle de Minerais de l'Ouest". Role of chemistry in processing of uranium. (C general, 1-2; U)

180-C. (Russian.) **Electrolytic Preparation of the Four-Component Alloys, Nickel - Iron - Molybdenum - Manganese and Nickel-Iron-Molybdenum-Copper.** T. F. Frantsevich-Zabludovskaya and K. B. Kladnitskaya. *Zhurnal Prikladnoi Khimii,* v. 30, Mar. 1957, p. 400-406. (CMA)

Ternary Ni-Fe-Mo alloys obtained electrolytically in previous work can be used for manufacturing metal-ceramic soft magnets. Since it has been observed that the magnetic properties of such alloys are improved by the addition of 0.5% manganese of copper, the authors attempted the preparation of the four-component alloys by the same method of electrolytic coprecipitation, a procedure that has not yet been described. They were able to obtain such alloys from ammonium citrate baths and observed that, while the composition of the copper alloy is strictly reducible, that of the manganese alloy suffers considerable variations due to different valencies of molybdenum in the electrolyte. Also while the X-rays of the copper alloy show a single phase of a solid solution, that of the manganese alloy reveals the presence of two phases, an α-Ni solid solution and another unidentified phase. 12 ref. (C27; SGA-n, Ni)

181-C. On the Mathematical Theory of Zone-Melting. I. Braun and S. Marshall. *British Journal of Applied Physics,* v. 8, Apr. 1957, p. 157-162.

A complete solution is presented of the equations governing the redistribution of solutes in zone-melting processes. The effect of "normal freezing" in the last zone-length of a bar is treated. The solutions hold for all values of the distribution coefficient K. Numerical calculations have been made of the concentration profiles resulting from repeated zone melting. Specimen graphs are given. (C28k)

182-C. Ion-Exchange and Solvent-Extraction Studies With Polonium. J. Danon and A. A. L. Zamith. *Journal of Physical Chemistry,* v. 61, Apr. 1957, p. 431-434.

The ion-exchange and solvent-extraction behavior of polonium in

hydrochloric and nitric acid media. The tendency of polonium to form complexes and its oxidation-reduction reactions are discussed. (C19s; Po)

183-C. Floating-Zone Melting of Refractory Metals by Electron Bombardment. A. Calverley, M. Davis and R. F. Lever. *Journal of Scientific Instruments*, v. 34, Apr. 1957, p. 142-147.

An apparatus which produces floating liquid zones in vertical rods of refractory metals is described. Movement of the zone along the specimen can purify it in three ways, namely, outgassing on a vacuum fusion, evaporation of volatile impurities, and segregation of impurities in the liquid zone. (C28k, 1-2; EG-d)

184-C. Resin-in-Pulp Method for Recovery of Uranium. R. F. Hollis and C. K. McArthur. *Mining Engineering*, v. 9, Apr. 1957, p. 443-449.

Method for recovering dissolved uranium from acid-leached pulps by direct contact with heads made of strong base anion exchange resins. Process development, variables, chemistry and design and operation of resin in pulp pilot plant. (C19s; U)

185-C. Development of the Acid Leaching Process for the Extraction and Recovery of Uranium From Rand Cyanide Residues. P. A. Laxen and M. G. Atmore. *South African Institute of Mining and Metallurgy, Journal*, v. 57, Jan. 1957, p. 359-375.

The recovery of uranium from pregnant solutions initially comprised precipitation at pH 6-7 and retreatment of the low-grade precipitate. The precipitation of high-grade uranous phosphate was developed on a pilot-plant scale. This procedure was superceded by the effective and currently used ion exchange process. (C19n, C19s; U)

186-C. History of the Development of the Ion Exchange Process as Applied to Uranium Extraction. R. E. Robinson and R. G. Velthuis. *South African Institute of Mining and Metallurgy, Journal*, v. 57, Jan. 1957, p. 376-385.

Principles of the ion exchange process; "life" of resins; development of the anion exchange process. (C19s; U)

187-C. Review of Uranium Leaching Practice in South Africa. E. T. Pinkney. *South African Institute of Mining and Metallurgy, Journal*, v. 57, Jan. 1957, p. 386-402.

Leaching practice and reagent preparation and handling; tables of equipment for uranium leaching. 4 ref. (C19n; U)

188-C. Calculations for Continuous Casting. J. Czikel. *Henry Brutcher Translation* No. 3853, 2 p. (From *Neue Hütte*, v. 1, no. 9, 1956, p. 561-562.) Henry Brutcher, Altadena, Calif.

The two basic requirements for satisfactory results in continuous casting. Nomograms for calculating the rate of descent of the bar and the pouring rate in continuous casting. (C5q, D9q)

189-C. Zone Purification of Reactive Metals. R. L. Smith and J. L. Rutherford. *Journal of Metals*, v. 9, *AIME Transactions*, v. 209, Apr. 1957.

Apparatus and technique for purifying reactive high melting point metals such as iron, titanium, zirconium, nickel and molybdenum by floating zone method. Radioactive tracers proved useful in determining conditions to effect redistribution of solute. Data from tensile tests on purified iron at liquid nitrogen and liquid helium temperatures. (C28k, 1-2; Fe, Ti, Zr, Ni, Mo)

190-C. Tributyl Phosphate Processing of Plutonium-Aluminum Alloy Fuels. R. G. Hart. *Atomic Energy of Canada Ltd.*, CRDC-630, Mar. 1957, 24 p.

A system of extraction using 20% tributyl phosphate-soltrol would give good plutonium recovery but poor fission product decontamination. (C19, T11g; Pu, Al)

191-C. Vertical Casting Wheel Now in Full Production at Utah Copper Refinery. *Engineering and Mining Journal*, v. 158, Apr. 1957, p. 75-77.

Vertical casting wheel design and operation. (C5, 1-2; Cu)

192-C. Titanium Metallurgy. Pt. III. Reduce Titanium Chloride in Fused Alkalinous Chloride by Solutions of Alkalinous Metals. R. S. Dean, L. D. Resnick and I. Hornstein. *Industrial Laboratories*, v. 8, June 1957, p. 93-95. (CMA)

A study of the reaction between fused alkalinous chloride solutions of the alkali metal and titanium chlorides showed that the activity of the metal was not a linear function of its concentration. The anal-

ysis of titanium present in the melts and its valence state is necessary for an understanding of the equilibria involved. The analytical method used was based on the liberation of hydrogen by sodium from acidified ferric salts while Ti^{++} reduces the salts without gas formation. Procedures are given for the analysis of an electrolyte and graphs are shown. (C1p; Ti)

193-C. Cheaper Titanium. *Chemical and Engineering News,* v. 35, June 17, 1957, p. 83. (CMA)

Armour Research Foundation has a new method of making pure titanium tetrachloride from ilmenite, which was developed by Friedric Schossberger. Ilmenite is dissolved in sulphuric acid and the iron content is reduced by two controlled crystallizations if its level interferes. The sulphuric solution is then treated with hydrogen chloride at 0° C. and saturated with potassium chloride. Further cooling precipitates K_2TiCl_6, from which titanium tetrachloride is recovered on heating in the range 330-400° C. Iron remains behind. Cheaper ore and lower temperatures can be used. (C19; Ti, RM-n)

194-C. Progress in the Continuous Casting of Tin Bronzes. E. C. Ellwood. *Foundry Trade Journal,* v. 102, May 23, 1957, p. 627-633.

History and development of vertical continuous casting process; machine design and processes used in several countries; die design, lubrication and the limitations of continuous castings; comparison of mechanical properties of leaded gunmetal continuously and sand-cast. 7 ref. (C5q, 1-2; Cu, *Sn*)

195-C. Selective Sulfation for Cadmium Recovery at Josephtown Smelter. R. E. Lund and D. E. Warnes. *Journal of Metals,* v. 9, *AIME Transactions,* v. 209, Apr. 1957, p. 608-611.

Sulphation pattern of cadmium oxide by zinc sulphate and sulphating characteristics of other sulphides and oxides at elevated temperatures was investigated. Heat treatment to sulphate cadimum oxide allows water leaching for cadmium recovery and has commerical application in treatment of cadmium fume obtained in sintering of zinc concentrate. 3 ref. (C19, A8a; Cd)

196-C. Continuous Cast Light Alloy Ingot Surfaces. P. N. Nielsen and V. Kondic. *Metal Industry,* v. 90, Apr. 12, 1957, p. 285-288.

Study of mold surface condition, type of lubricant and casting characteristics of alloying in relation to rippling, hot tears, exudation, scores, striations and dross on the surface of continuously cast ingot of light alloys. Theoretical considerations and practical application. 3 ref. (C5q; EG-a39, 9-21)

197-C. First Ferro-Uranium Made in America. Clarence T. Patterson. *Metal Progress,* v. 71, June 1957, p. 85-89.

Uranium oxide byproduct from radium refining was first smelted in an Acheson-type resistance furnace. Commercial alloy was later produced for toolsteel makers in a small carbon arc furnace, lined with sintered U_3O_8, by first forming a carbide from an oxide-coke mix, distilling off the carbon, and then dissolving boiler plate punchings in the molten uranium.
(C21d, A2; U, AD-n)

198-C. Processing of Uranium-Zirconium Alloys. J. W. Holladay, et al. *U.S. Atomic Energy Commission,* BMI-877, Oct. 20, 1953, 21 p. (CMA)

The preparation of U-Zr alloys by arc melting and induction melting was studied using tungsten arcs, helium atmospheres and water-cooled copper crucibles. Some double-melted alloys were not homogeneous and triple melting was used in some cases. Some arc-melted ternary alloys were sensitive to thermal shock and cracked when melting was stopped, but only one binary alloy cracked. Graphite crucibles were used in induction melting to give a higher carbon content. Forging and rolling data were obtained for U-Zr, U-Mo, U-Ti, U-Zr-Mo, U-Zr-Nb, U-Zr-Ti, U-Zr-Th and U-Zr-Sn. (C5h, C5j, 1-2; U, Zr)

199-C. Process for Separating Thorium Compounds From Monazite Sands. K. G. Shaw, M. Smutz and G. L. Bridger. *U.S. Atomic Energy Commission,* ISC-407, Jan. 1954, 107 p. (CMA)

Economic separation of thorium compounds from monazite sands after H_2SO_4 digestion and the treatment of byproduct lanthanons and uranium. After the thorium has been separated from the solution, the lanthanon phosphates are fractionally precipitated at about pH 2.3. Uranium phosphate and the rest of the lanthanons are precipitated at pH 6.0. Pilot plant study shows

that the method proposed is about $2.37 per lb. cheaper than the Battelle method. (C27; Th)

200-C. Low-Hafnium Zirconium Project, Progress Report for Jan. 16, 1950 to Mar. 16, 1950. S. C. Cogburn, Jr., and H. M. Fisher. *U.S. Atomic Energy Commission, NYO-1082,* Mar. 28, 1950, 27 p. (CMA)

When propanol was changed to methanol for the decomposition of low-hafnium zirconium complex, the phosphorus impurity was reduced by 50 to 75%. Research on the direct production of $ZrCl_4$ from the decomposition of the $ZrCl_4 \cdot POCl_3$ has been negative, and some metathetic reactions studied are, so far, impractical. Using low-hafnium "Zirkite" ore would double the capacity of the pilot plant. (C1p; Zr, RM-n)

201-C. On the Anhydrous Reduced Halides of Zirconium and Hafnium. E. M. Larsen and J. J. Leddy. University of Wisconsin, Technical Report 9, under contract N7onr-28504. *U.S. Office of Technical Services,* PB 123133, Aug. 1955, 21 p. (CMA)

Reduction of zirconium or hafnium tetrahalides to the trihalides (solid) with a zirconium or hafnium reductant was studied and X-ray data on the trihalides obtained. A preparative method was devised using high temperatures and pressures. (C1p; Zr, Hf)

202-C. (Russian.) **Mechanism of Formation of Zirconium Sponge in the Magnesium-Thermal Process of Preparing Zirconium.** F. G. Reshetnikov and E. N. Oblomeev. *Atomnaya Energiya,* no. 2, v. 5, May 1957, p. 459-462. (CMA)

By adding to magnesium a few percent of a soluble but nonvolatile ingredient, such as aluminum or tin, it becomes possible to solve the question of the origin of the zirconium sponge on the walls of the container above the level of the reaction bath. It was found that this sponge is formed in the reaction between vapors of zirconium chloride and liquid magnesium that rises by capillary action through the sponge already formed. The effect of the perimeter of the container having been thus brought to light, it is recommended that this effect be increased by adding internal partitions. 7 ref. (C26; Zr, 6-24)

203-C. Magnesium Extraction Process for Plutonium Separation From Uranium. Irvin O. Winsch and Leslie Burris. *Chemical Engineering Progress,* v. 53, May 1957, p. 237-242.

High-temperature extraction process for the separation of plutonium from nuclear reactor core and blanket materials is described and data are presented. Molten magnesium, which is immiscible with molten uranium, may be used to extract plutonium from uranium. The plutonium may be separated from the magnesium by volatilization of the magnesium. Auxiliary operations such as molten-metal transfer, phase separation and sampling are also discussed. 6 ref. (C26; Pu, U, *Mg,* 17-7)

204-C. Bureau of Mines Process for Reactor-Grade Zirconium and Hafnium. *Chemical Week,* v. 80, July 29, 1957, p. 73. (CMA)

The Bureau of Mines has developed a process at Albany, Ore., for producing reactor-grade zirconium and hafnium by reducing the metal chlorides with a magnesium-sodium mixture. The hafnium purification by iodine dissociation is obviated. Magnesium and liquid sodium are charged into the reactor. The temperature is brought to 725-759° C., and is further raised to 850° C. when the sodium is consumed. Magnesium completes the reduction. The eutectic salt produced melts at 650° C. and drains out of the reactor during distillation. The reason for fewer impurities is unknown. In scale-up operations now under way, 184-lb. batches of hafnium will be produced. (C1p; Zr, Hf)

205-C. Preparation of Electrolytic Bath of Molten K_2TiF_6. T. Hatano, M. Kawane and S. Okada. *Electrochemical Society of Japan, Journal,* v. 25, Feb. 1957, p. 63-69. (CMA)

The optimum condition in the preparation of the salts for an electrolytic bath of molten K_2TiF_6 and the properties of the electrolyte were studied. The chloride method was used in preference to the carbonate method for refining lithium chloride. $TiCl_4$ is the best starting point for the double fluoride. The only suitable crucible material is artificial graphite. Melting temperatures were less accurate with greater concentrations of double fluoride. The anhydrous K_2TiF_6 crystal has the lattice parameters $a = 5.71$Å and $c = 4.65$Å. (C23p; Ti)

206-C. Atmospheric Versus Pressure Leaching of Uranium Ores. R.

G. Beverly, A. W. Griffith and W. A. Millsap. *Journal of Metals,* v. 9, June 1957, p. 746-751.

Pilot plant studies on alkaline leach process by which uranium is extracted from ore by hot carbonate solutions. Factors affecting leach include contact time, temperature, oxidation, pressure, sodium carbonate and bicarbonate concentrations, size of grind and pulp density. Leaching time reduced with high temperature and pressures. 10 ref.
(C19n, 2-24; U, RM-n)

207-C. **Ammonium Carbonate Pressure Leaching of Uranium Ores.** B. G. Langston, R. D. Macdonald and F. M. Stephens, Jr. *Journal of Metals,* v. 9, June 1957, p. 752-756.

Process for dissolution of uranium in ore by ammonium carbonate solutions and precipitation of uranium from pregnant solutions. Nine ores studied to evaluate effect of temperature, pressure, carbonate concentration, amount of oxidation required, comparison with sodium carbonate and acid leach methods as to economy. 3 ref. (C19n; U, RM-n)

208-C. **Uranium Recovery by the Solvent Extraction Process.** James D. Moore. *Journal of Metals,* v. 9, June 1957, p. 757-761.

Solvent extraction process for recovering uranium from the leach solution where sulphuric acid leaching method has been used. Dodecyl phosphoric acid solvent used in pilot plant at Vitro Uranium Co. Hydrochloric acid used to recover uranium from solvent. (C19n; U)

209-C. **Manganese From Low-Grade Ores by the Ammonium Carbonate Process.** J. Y. Welsh and D. W. Peterson. *Journal of Metals,* v. 9, June 1957, p. 762-765.

Process depends on the fact that manganous oxide forms soluble complex in aqueous solutions containing high concentrations of ammonia and carbon dioxide. This complex is an intermediate in formation of manganese carbonate. Gives equipment and operating conditions for process which has found successful commercial application.
(C19; Mn, RM-n)

210-C. **Some Notes on Oroya Copper Slags.** I. L. Barker, J. S. Jacobi and B. H. Wadia. *Journal of Metals,* v. 9, *AIME Transactions,* v. 209, June 1957, p. 774-780.

Investigation of the interrelationship between copper and magnetite content of reverberatory slags; withholding converter slag when melting reverberatory slag resulted in cleaner waste slag; possibility of treating converter slag by separate process. 4 ref. (C21c; Cu, RM-q)

211-C. **Reduction of Nickel by Hydrogen From Ammoniacal Nickel Sulfate Solutions.** V. N. Mackiw, W. C. Lin and W. Kunda. *Journal of Metals,* v. 9, *AIME Transactions,* v. 209, June 1957, p. 786-793.

Detailed examination of the reaction by which nickel can be precipitated from aqueous ammoniacal nickel sulphate solutions by hydrogen at elevated pressures and temperatures. Discusses thermal dynamics; studies effect of ammonia temperature, ferrous iron concentration and its catalytic effect and considers autocatalytic nature of nickel reduction. 12 ref. (C26; Ni, *H*)

212-C. **Dissolution of Lead Sulfide Ores in Acid Chlorine Solutions.** M. I. Sherman and J. D. H. Strickland. *Journal of Metals,* v. 9, *AIME Transactions,* v. 209, June 1957, p. 795-800.

Study of reaction of chlorine in aqueous solutions with galena to form both sulphate and elemental sulphur; sulphur formed by hydrolysis of sulphur chloride which adheres to the ore; kinetic data and calculations of chemical rate constants and energy of activation. 8 ref. (C19r, P13a, P13b; Pb)

213-C. **Use of the Ion-Exchange Process in the Extration of Uranium From the Rand Ores With Particular Reference to Practice at the Randfontein Uranium Plant.** D. E. R. Ayers and R. J. Westwood. *South African Institute of Mining and Metallurgy, Journal,* v. 57, Feb. 1957, p. 459-521.

Uranium sulphate obtained by leaching low-grade uranium ores with sulphuric acid can be adsorbed on ion exchange resins as an anionic uranium sulphate complex. Most of the impurities in the solutions are not adsorbed, resulting in an eluate in which the uranium has been concentrated approximately 20-fold. The plant and method of its operation are described in detail with graphs of the concentrations of the various ions involved throughout the cycle. Performance figures are given. 42 ref. (C19s; U)

214-C. Recovery of Tributyl Phosphate Solvent Employed in the Extraction Separation of Hafnium and Zirconium. W. R. Millard and R. P. Cox. *U. S. Atomic Energy Commission,* ISC-234. 30 p. (CMA)

Development of the tributyl phosphate extraction of hafnium from zirconium. About five stages are necessary for complete water-stripping of the zirconium in the mixer-settler extractor. The degeneration of the solvent on extended use may be eliminated by two methods; the batch method with sulphuric acid and sodium carbonate washes, and a continuous method with sulphuric acid and water washes. The latter is faster because of the shorter settling times. Further work is necessary to evaluate the continuous regeneration process. (C19; Hf, Zr)

215-C. Chlorination of Purified Oxide. L. P. Twichell. *U. S. Atomic Energy Commission,* Y-574. Mar. 10, 1950. 16. p. (CMA)

Various methods of chlorinating zirconium-dioxide were studied. None of the liquid phase reactions were successful, nor was chlorination at high temperature. Conversion was satisfactory with the reactant CCl_4 at 500° C. Equipment described. The faster reaction rate at higher temperatures is offset by contamination from the equipment. The cost per pound of contained zirconium for this chlorination is $0.61. (C19r; Zr)

216-C. Description of Permanent Zirconium Plant. Carbide and Carbon Chemicals Co. *U. S. Atomic Energy Commission,* Y-B46-114. Sept. 1951, 14 p. (CMA)

The Y-12 plant for producing hafnium-free zirconium is described. The process involves hafnium extraction, phthalate purification, conversion to the hydroxide, chlorination and magnesium reduction.
(C19r, C26; Zr)

217-C. Attempts to Manufacture Uranium-Zirconium Alloys by Co-Reduction of Their Tetrafluorides. L. G. Weber. *U. S. Atomic Energy Commission,* NYO-1346. Sept. 23, 1952, 6 p. (CMA)

The bomb reduction of uranium and zirconium tetrafluorides together with magnesium to form the alloys was studied. The bomb liner was magnesium fluoride. There were no operational difficulties, but stratification was shown in the zirconium content range 0.2-0.4% and heterogeneity in the 5% zirconium region. (C1p; U, Zr)

218-C. Separation of Zirconium-Hafnium Using Solutions Containing Tributylamine. R. G. Shaver, et al. *U. S. Atomic Energy Commission,* KT-148. Oct. 18, 1952, 34 p. (CMA)

Method for separation of hafnium from zirconium, based on solvent extraction with thiocyanate from the tetrachloride in a spray-column system, is noted. The improvement of the process was studied by adding amines to dissolve the solid thiocyanate which forms in the column. Tributylamine offers the best compromise between aqueous insolubility and effectiveness in reducing thiocyanic acid decomposition. Formation of solids renders the system inoperable at about 50% amine concentration. Emulsification and flooding in the pulse column occur only when amine is present. The organic phase becomes dark and viscous and is not regenerated by the scrubbing system. Hafnium production is improved more than zirconium production by the addition of amines.
(C1p; Zr; Hf)

219-C. Literature Survey on the Co-Reduction Process for Producing Zirconium-Uranium Alloys. W. B. Clymer and O. R. Magoteaux. *U. S. Atomic Energy Commission,* FMPC-193. Apr. 30, 1953, 5 p. (CMA)

A survey of five references to zirconium-uranium alloys and their production was used to gather data on the co-reduction method of producing the alloys. The development work of Iowa State College and Mallinckrodt Chemical Works is cited. The alloys produced are divided into two classes, depending on whether the zirconium content is more or less than 10%. For those with less, fused dolomite liners are used; for those with more, graphite liners are used. K_2ZrF_6 gives a better product than ZrF_4 when calcium or magnesium is the reductant. Iowa State College used iodine as a booster. (C26; Zr, U)

220-C. Process for Separating Thorium Compounds From Monazite Sands. K. G. Shaw, M. Smutz and G. L. Bridger. *U. S. Atomic Energy Commission,* ISC-407. Jan. 1954, 107 p. (CMA)

The sulphuric acid digestion of monazite sand was studied for the purpose of deriving a thorium-con-

taining matter suitable to purification by liquid-liquid extraction. The process developed includes the fractional precipitation of the lanthanons by neutralization with ammonium to pH 2.3 subsequent to the thorium separation and prior to the precipitation of uranium phosphate and the remaining lanthanons. The concentrates containing lanthanons were suitable to the separation of individual lanthanons. The process is about $2.37 cheaper per lb. of thorium produced than the Battelle process. 52 ref. (C19n; Th)

221-C. **Solid and Liquid Drossing of Thorium Containing Tracer Level Fission Products.** N. D. Potter. Atomics International. *U. S. Atomic Energy Commission,* NAA-SR-1734, Apr. 15, 1957, 16 p.

Thorium, containing tracer amounts of fission products, was drossed at about 1700 and 1100° C. In the latter case 10% manganese alloy was used. Materials used in the drossing process included solid oxides, carbides, nitrides, sulphides, and a liquid mixture of oxide-fluoride. The best decontamination of fission products was achieved by drossing with sulphide and the oxide-fluoride mixture, which removed some zirconium. (C6; Th)

222-C. (French.) **Methods for Checking the Purification of Aluminum by Zone Melting.** F. Montariol. *Bulletin de l'Institut International Du Froid* (International Institute of Refrigeration), Supplement, Annexe 1956-2, Sept. 1956, p. 63-69.

Experimental conditions employed. Two heating processes were used: the resistance oven and induction heating. Results of both methods are given together with anomalies observed in certain purification diagrams. 4 ref. (C28k, 1-2; Al)

223-C. (French.) **Separation of Certain Rare Earth Elements by Dry Means. Application to Ytterbium.** Jean-Claude Achard. *Comptes Rendus,* v. 244, June 17, 1957, p. 3059-3062. (CMA)

The divalent elements samarium, europium and ytterbium can be separated by distillation from a mixture of rare earth oxides and carbon at high temperature in vacuo. It is shown that ytterbium can be eliminated in its entirety from a mixture of rare earths and recovered either in the form of the pure metal or a lower oxide. 5 ref.
(C22g, 1-23; EG-g, Yb)

224-C. (German.) **Zinc Research in the German Democratic Republic.** Kurt Peukert. *Neue Hütte,* v. 2, Feb-Mar. 1957, p. 186-191.

Discussion on zinc-containing raw materials; lead concentrates of the Freiberg ore reservoir; zinc-lead flue dust from the Mansfield smelting works; zinc, cadmium, indium extraction from Freiberg floated blende through roasting and electrolysis; use of the oxygen-roasting technique for Mansfield smelting works flue dust; introduction of reverberatory-lime soda melting; increase of zinc sulphate, zinc oxide and lead products; improvements in selenium, germanium, gallium, iodine and rhenium extraction.
(C general, B14, B15, A8a; Zn, Se, Ge, Ga, Rh, RM-n)

225-C. (Japanese.) **Thermal Production of Metallic Magnesium From Sea Water Magnesia.** Shoichro Nagai, Jotaro Ono and Hiroshi Yoneyama. *Light Metals,* v. 7, May 1957, p. 60-64.

Raw materials used in this experiment are magnesia obtained from sea water and calcium silicide reducing agent. The magnesia and calcium silicide are ground and mixed, and briquetted. When the briquet is vacuum-reduced for several hours at high temperature, magnesium is evaporated from the briquets and condensed on a removable sleeve of the retort. Reaction time, reaction temperature, mol ratio and particle size are discussed.
(C22h, B16d; Mg)

226-C. (Japanese.) **Thorium for Nuclear Reactors.** *Metals,* v. 27, June 1957, p. 475-479.

Methods of production of metallic thorium in Japan; reduction of thorium from thorium oxide; sintering and sintering furnaces.
(C general, B16a; Th)

227-C. **Manufacture of Titanium.** James Taylor. *Advancement of Science,* v. 13, June 1957, p. 359-363. (CMA)

Titanium tetrachloride production, effected by chlorinating a suitable rutile ore-coke mixture. Magnesium and sodium reductions of titanium tetrachloride. Titanium melting operations now use uncooled consumable titanium electrodes. Titanium fabrication methods differ from the conventional mainly in the need for lubrication to prevent galling and seizing, and the need to guard against contamination.
(C general, F general, G general; Ti)

228-C. **New Commercial Process for Electrowinning Manganese.** M. C.

Carosella and R. M. Fowler. *Journal of the Electrochemical Society,* v. 104, June 1957, p. 352-356.

With new process it is possible to smelt a manganese ore to ferromanganese and a slag, then recover the manganese in the slag as electrolytic manganese. 21 ref.
(C23p; Mn)

229-C. Preparation of Thorium Bismuth Dispersions From Electrolytic Thorium. M. E. Sibert, M. A. Steinberg and R. J. Teitel. *Journal of the Electrochemical Society,* v. 104, June 1957, p. 374-378.

Materials are potentially useful as fuels for liquid metal reactors. Dispersions were prepared by addition of crushed thorium cathode deposits to bismuth, addition of as-deposited cathode to bismuth in the cell, and by electrolysis of ThCl, using a liquid bismuth cathode. 11 ref.
(C23p; Th, Bi)

230-C. Arc Melting of Reactive Metals. J. L. Ham and C. B. Sibley. *Journal of Metals,* v. 9, July 1957, p. 976-980. (CMA)

The cold mold arc melting of reactive metal ingots is practical and versatile. The trend is toward the use of consumable electrodes and vacuum. The discussion covers power partition, melting efficiency, pressure, bath volume, superheat and minimum vacuum pumping speed. The energy required to melt titanium, zirconium, molybdenum and vanadium and other metals is theoretically proportional to their melting points, but in practice depends on electrode resistance, pressure and mold size.
(C5h; Ti, Zr, Mo, V)

231-C. Quick Trip From Ingot to Strip. F. L. Church. *Modern Metals,* v. 13, June 1957, p. 36-40.

New Hazlett machine produces aluminum slab ½ to 3 in. thick, up to 36 in. wide at speeds of up to 25 ft. per min. Tolerances are tight, surface smooth, grain size small, scrap negligible, costs low.
(C5q, 1-2; Al)

232-C. Something From "Nothing". Vacuum Melting, Heat Treating Produce Better Metals. Roger Giler. *Plant Engineering,* v. 11, June 1957, p. 128-131.

Reasons for using vacuum in metal treating; review of vacuum equipment; vacuum induction melting furnaces—types and applications.
(C5, H general, 1-23, 1-2)

233-C. Purification of Nuclear Fuels by Melting in Refractory Oxide Crucibles. H. M. Feder, N. R. Chellew and M. Ader. Argonne National Laboratory. *U. S. Atomic Energy Commission,* ANL-5255, Mar. 15, 1954, 49 p.

Investigation of the phenomena occurring during the melting of irradiated uranium in refractory oxide crucibles. Under favorable circumstances certain fission product elements are separated to a considerable extent. Some of the separations achieved have been correlated by theoretical considerations. Application of this process to reactor technology is considered. Its use in connection with the enriched core of a fast neutron pile appears to be particularly attractive.
(C28, T11g, 17-7; U)

234-C. Studies of the Bomb Reduction of Thorium Halides. H. A. Saller, J. R. Keeler and L. J. Cuddy. Battelle Memorial Institute. *U. S. Atomic Energy Commission,* BMI 988, Mar. 22, 1955, 19 p.

The bomb reduction of ThF_4 was studied primarily to determine the feasibility of substituting magnesium for all or part of the calcium reductant. Limited investigations of the ThF_4 reduction were also made to determine the effects produced by variation of the amount of $ZnCl_2$ and calcium in the charge, substitution of ZnF_2 for the $ZnCl_2$ booster, and addition of salts to the charge to reduce the viscosity of the slag.
(C1p; Th)

235-C. Recovery of Uranium From Fused Salt Melts by Electrodeposition. L. W. Niedrach and G. R. Fountain. Knolls Atomic Power Laboratory, *U. S. Atomic Energy Commission,* KAPL-1693, Mar. 29, 1957, 18 p.

Recovering uranium values from waste salts of an electrorefining process for reactor fuels; behavior of uranium and representative active metal fission product elements. 10 ref. (C23p; U)

236-C. Zone Melting of Uranium. C. I. Whitman, V. Compton and R. B. Holden. Sylvania Electric Products, Inc. *U. S. Atomic Energy Commission,* SEP-179, June 15, 1955, 20 p.

Possible application of the zone melting technique to the separation of uranium from fission products

and other impurities. Although zone melting did not appear promising as a method of processing irradiated uranium because of slagging of fission products into the surface of the bar, this technique has potential application to removing such fission products as zirconium, columbium and ruthenium, and to purifying ordinary uranium from such impurities as boron, iron, silicon, nickel and cobalt. (C28k, 217; U, 9-1)

237-C. Research on Intermetallic Containers for Melting Titanium. W. B. Crandall, C. H. McMurty and D. D. Button. Wright Air Development Center, Technical Report 56-663. *U. S. Office of Technical Services,* PB 121948. Feb. 1957, 39 p. (CMA)

The utility of Mo_3Al as a container for titanium was determined experimentally. Titanium wets the container during melting but takes in only 3% total molybdenum and aluminum if the time and temperature used are minimized. (C5, 1-2, 17-7; Ti, Mo, Al)

238-C. (German.) **Pressure Leaching of Sulphide Ore.** E. Discher and F. Pawlek. *Zeitschrift für Erzbergbau und Metallhüttenwesen,* v. 10, Apr. 1957, p. 158-166.

Investigation into the effect of pressure, temperature, grain size, reaction time and concentration in aqueous solution on pure natural sulphide of copper, nickel, zinc, iron and lead, and on Rammelsburg ore, Australian lead-zinc ore, Peruvian copper-zinc ore and a South African nickel-copper concentrate. 4 ref. (C10n; Cu, Ni, Zn, Fe, Pb, RM-n)

239-C. (Japanese.) **Theoretical Analysis and Practical Measurement of Electromagnetic Forces in Vertical Spike-Type Aluminum Smelting Furnaces.** Shizuo Asano and Ichiro Tomohiro. *Light Metals,* v. 7, May 1957, p. 43-50.

Electromagnetic forces in large aluminum smelting furnaces are of such strength that normal operation may be disturbed. The vertical spike-type furnace is characterized by perpendicular anodes and bus bars. Electromagnetic forces of the spike-type furnaces are evaluated and their effect on the metal level are investigated. (C23p, 1-2; Al)

240-C. (Rumanian.) **Production of Titanium Dioxide.** Galia Gruder, Inna Giurcanu and C. Raducanu. *Revista de Chimie,* v. 8, Apr. 1957, p. 231-233. (CMA)

A laboratory procedure for the production of titanium dioxide from the concentrates of alluvial sands consists of the treatment of the concentrates with sulphuric acid, dissolving of the sulphates, reduction of the iron, separation of the iron sulphate by crystallization and hydrolysis. Yields of 80.5% TiO_2, with a purity of 98% were obtained. 13 ref. (C10; Ti)

241-C. (Russian.) **Study of the Iodide Method of Refining Zirconium. Pt. 1 and 2.** V. S. Emel'yanov, P. D. Bystrov and A. I. Evstyukhin. *Atomnaya Energiya,* no. 1, 1956, p. 43-51; no. 3, 1956, p. 122-131. (CMA)

The mechanism of iodide refining of zirconium was investigated using small flasks in which crude zirconium and iodine were placed separately and refined zirconium, formed from zirconium tetra-iodide, was deposited around a heated tungsten wire. It was found that the pressure of the tetra-iodide played an essential part in determining the rate of the deposition. 17 ref. (C1p; Zr)

242-C. The Production of Titanium Trichloride by Arc-Induced Hydrogen Reduction of Titanium Tetrachloride. T. R. Ingraham, K. W. Downes and P. Marier. *Canadian Journal of Chemistry,* v. 35, Aug. 1957, p. 850-859. (CMA)

Method of producing pure, comminuted $TiCl_3$ based on the ability of titanium to liberate hydrogen from HCl gas. The hydrogen reacts with pure $TiCl_4$ vapor in an arc of electrodeless discharges, forming a blue glow; $TiCl_3$ precipitates on the walls of the discharge tube. (C26; Ti)

243-C. Experimental Electric Smelting of Ilmenite to Produce High-Titania Slag and Pig Iron. G. E. Viens, R. A. Campbell and R. R. Rogers. *Canadian Mining and Metallurgical Bulletin,* v. 50, July 1957, p. 405-410. (CMA)

Smelting of beneficiated ilmenite ore in a continuous 3-phase, 250-kva, open-top electric furnace. In a comparative study, minus ¼-in. ore was smelted using the standard method, and fine ore of the order of minus 14 mesh was smelted in briquet form by the open bath method, and in the unagglomerated form by the cold dry-top method. The last method was found to be superior. 8 ref. (C21d; Ti)

244-C. Refining Zone Refining. *Chemical and Engineering News,* v. 35, Aug. 12, 1957, p. 88-89.

An automatic refining device designed to produce relatively large amounts of high-purity materials such as silicon. (C28k, 1-2)

245-C. New Process for Titanium. *Chemical Engineering Progress,* v. 53, July 1957, p. 94. (CMA)

Advantages claimed for the process include use of low-grade ore or any titanium-containing materials, use of hydrochloric acid rather than chlorine for chlorination, low operating temperatures for chlorination and decomposition; and high-purity titanium tetrachloride product due to selective chlorination, which excludes co-precipitation of other impurities. (C19r; Ti)

246-C. Cold Chlorination: Key to Low-Cost $TiCl_4$. *Chemical Week,* v. 80, July 20, 1957, p. 76, 78. (CMA)

Ilmenite is dissolved in sulphuric acid and the iron content is reduced by two controlled crystallizations if its level interferes. The sulphuric solution is then treated with hydrogen chloride at 0° C. and saturated with potassium chloride. Further cooling precipitates K_2TiCl_6, from which $TiCl_4$ is recovered on heating in the range 330-400° C. Iron remains behind. (C19r; Ti)

247-C. Electrorefining Titanium. *Metal Industry,* v. 91, July 19, 1957, p. 47-48. (CMA)

Titanium has been successfully electro refined in the laboratory by a fused-salt electrolysis with impure scrap or sponge as the anode; pure titanium is collected at the cathode. The cathode current density depends mainly on the amount of soluble titanium chloride in the electrolyte but the condition of the anode is also influential. (C23p; Ti)

248-C. Zone Melting. W. G. Pfann. *Metallurgical Reviews,* v. 2, 1957, p. 29-76.

Types of zone-melting process, including zone refining, zone leveling and single-crystal growth; theory, practice and applications. 79 ref. (C28k, N3r)

249-C. How Calera Solved Metallurgical Problems at Garfield Cobalt Plant. J. S. Mitchell. *Mining World,* v. 19, June 1957, p. 54-56.

New process for producing cobalt granules, operational problems, mechanical weaknesses. Batch operations to be replaced by continuous flow and plant is to be added for electrolytic refining.
(C general; Co)

250-C. Purification of Thorium by Solvent Extraction. Morton Smutz, M. E. Whatley and G. L. Bridger. Iowa State College, *U. S. Atomic Energy Commission,* ISC-415, July 1953, 92 p.

Extraction of thorium nitrate with tributyl phosphate from aqueous solutions containing phosphate, sulphate and nitric acid. The specific objective was to develop a process to produce pure thorium from a thorium concentrate obtained by the selective precipitation of thorium phosphate from a monazite-sulphuric acid solution. (C27; Th)

251-C. Arc Melting and Continuous Casting of Uranium. H. A. Saller, R. F. Dickerson, and E. L. Foster, Jr. Battelle Memorial Institute, *U. S. Atomic Energy Commission,* BMI-926, July 13, 1954, 31 p.

A melting procedure that would be satisfactory for use on a large production furnace was developed. This technique is based entirely on changing arc voltages and therefore would be amenable to automation by means of electronic controls. This melting technique produced ingots with no shrinkage voids and without unconsolidated areas. (C5h, C5q; U)

252-C. Large-Batch Melting of Uranium. R. M. Lang, G. W. Rengstorff, N. H. Keyser, and H. W. Lownie, Jr. Battelle Memorial Institute, *U. S. Atomic Energy Commission,* BMI-932, Aug. 2, 1954, 33 p.

Both a 3-phase direct-arc furnace and a high-frequency induction furnace were used. In the direct-arc furnace, only 15% of the metal charged was recovered as metal. In the induction furnace, close to 100% of the metal charged was recovered as metal in the ingot.
(C5h, C5j; U)

253-C. Recovery of Thorium From Brazilian Monazite Sludge by Nitric Acid Digestion. W. A. Meeley, M. J. Snyder and R. B. Filbert, Jr. Battelle Memorial Institute, *U. S. Atomic Energy Commission,* BMI-946, Aug. 24, 1954, 27 p.

The method can be used as the first step in a process for the recovery and purification of thorium from Brazilian sludge since the treated sludge is in a suitable condition for slurry extraction to recover the thorium. The problems of corrosion and the removal of inter-

fering ions from the sludge were studied briefly. (C19; Th)

254-C. Low-Temperature Chlorination of Columbium-Bearing Titanium Minerals. V. A. Nieberlein. *U. S. Bureau of Mines. Report of Investigations* 5349, July 1957, 15 p. (CMA)

A cheap extraction process for low-titanium ore with valuable minor metals (e.g., columbium) consists of reducing the ore concentrate with coke at high temperatures to form a carbide-suboxide sinter, and chlorinating in the range 400-500° C. using metallic apparatus. Iron chloride and columbium chloride are then separated by fractional condensation. Descriptions and diagrams of the apparatus. (C19r, 1-17; Ti, *Cb*)

255-C. (Japanese.) **Electrorefining.** *Electrochemical Society of Japan, Journal,* v. 24, Dec. 1956, p. 635-642.

Electrorefining of copper, gold, silver, nickel, cobalt, antimony, tin, cadmium, chromium and manganese. 69 ref. (C23p; Cu, Au, Ag, Ni, Co, Sb, Sn, Cd, Cr, Mn)

256-C. (Japanese.) **Extraction of Light Metals.** *Electrochemical Society of Japan, Journal,* v. 24, Dec. 1956, p. 678-681.

Electrorefining of aluminum, magnesium and titanium. 90 ref. (C23p; Al, Mg, Ti)

257-C. (Japanese.) **Electrolysis of Fused Salts.** *Electrochemical Society of Japan, Journal,* v. 24, Dec. 1956, p. 682-684.

Brief review of electrolysis of fused salts of alkali metals, alkali earth metals and special elements, such as zirconium, beryllium and uranium. 70 ref.
(C23p; EG-e, EG-f, Zr, Be, U)

258-C. (Russian.) **Production of Medium-Carbon Ferrochromium.** P. A. Sakharuk. *Stal',* v. 19, Apr. 1957, p. 326-328. (Also available as *Henry Brutcher Translation* no. 3995.)

Comparison of various methods of producing ferrochromium with medium (0.50 to 2.0%) carbon contents; refining of high-carbon ferrochromium by blowing with oxygen in a converter; mixing of low-carbon with high-carbon ferrochromium, the low-carbon grade having been produced by the flux silicothermic process or by fluxless silicothermy of lump (scarce) or fine (plentiful) ores. (C21; Fe, Cr, AD-n31)

259-C. Mechanism of Oxidation of Ferrous Ions by Atmospheric Oxygen in the Hydrometallurgy of Zinc. L. S. Getskin and V. D. Ponomarev. *Journal of Applied Chemistry of the USSR,* v. 29, July 1956, p. 1071-1076. (Translated by Consultants Bureau, Inc.)

A solution pH between 3 and 7 oxidation is a first-order reaction with respect to iron, with temperature coefficient of reaction rate of 2.08 indicating kinetic nature of process. Adsorption of oxygen by precipitates of ferric compounds plays important role in process. 5 ref. (C19; Zn)

260-C. Studies on Electrolytic Titanium From Fused Salts. K. Ono, et al. *Tohoku University, Research Institutes, Science Reports, Series A. Physics, Chemistry and Metallurgy,* v. 9, June 1957, p. 227-238. (CMA)

The mechanism of electrolysis was studied and results were compared with the two observed values of the decomposition voltage of K_2TiF_6. The dark black cathodic deposit was not metallic. Formation of Ti_2O_3 is thought to interfere with the electrolytic deposition of titanium. (C23p; Ti)

261-C. Refining of Thorium by Solvent Extraction. A. Ewing, S. J. Kiehl, Jr., and A. E. Bearse. Battelle Memorial Institute. *U. S. Atomic Energy Commission,* BMI-955, Oct. 19, 1954, 70 p.

Thorium up to 99.9 + % was obtained by extraction of mantle-grade $Th(No_3)_4$ with 30% TBP, 70% Solvesso 100, using nitric acid salting. Rare earths were undetectable in the purified thorium. 13 ref. (C19; Th)

262-C. Process for Separating Thorium Compounds From Monazite Sands. Kernal Glenn Shaw, Morton Smutz and G. L. Bridger. Iowa State College, *U. S. Atomic Energy Commission,* ISC-407, Jan. 1957, 107 p.

Studies to determine the optimum conditions for the digestion of monazite sand and for the separation of thorium, rare earths and uranium by fractional neutralization of the monazite sulphate solution. The most effective separation was obtained when the monazite solution was dilute and when ammonium hydroxide was used as a neutralizing agent. 52 ref. (C28; Th)

263-C. (French.) **Separation of Metals: Columbium and Tantalum.** Marcel Chaigneau. *Comptes Rendus,* v. 244, Feb. 11, 1957, p. 900-901.

Columbium can be separated from tantalum by subjecting pentoxide

mixture to action of chloride, bromide or iodide of aluminum under heat and vacuum conditions. A fractionated sublimation makes it possible, in all cases, subsequently to isolate the halogens thus formed. Aluminum iodide is the most favorable medium. 11 ref. (C19r; Cb, Ta)

264-C. (French.) **Refining of Protactinium by Chromatography and Electrophoresis on Paper.** Michael Lederer and Jacques Vernois. *Comptes Rendus,* v. 244, May 6, 1957, p. 2388-2390.

Study of solvents containing hydrofluoric acid which make it possible to avoid hydrolysis of Ta, Cb, Zr and Ti (which usually accompany Pa^{231}), and thus accomplish separation. 6 ref. (C19; Pa)

265-C. (French.) **Contribution to the Study of the Separation of Zirconium and Hafnium by Liquid-Liquid Extraction.** N. Isaac and R. de Witte. *Energie Nucleaire,* v. 1, Apr-June 1957, p. 71-76. (CMA)

Various stages of purification of technical zirconium oxide and of separation of zirconium and hafnium studied. 7 ref. (C28; Zr, Hf)

266-C. (French.) **Inorganic Chemical Industry in France. The Manufacture of Uranium.** Henri Guérin. *Nature,* no. 3262, Feb. 1957, p. 64-68.

French metallic uranium requirements are supplied entirely by Bouchet plant of government's Atomic Energy Commission. Process principles and details of production cycle at this plant.
(C general; U)

267-C. (Japanese.) **Recovery of Alkali and Vanadium From Waste Liquor Obtained by Treating Iron Sand by Sodium Sulphate.** Yozo Takimoto and Hiroshi Hattori. *Chemical Society of Japan, Journal, Industrial Chemistry Section,* v. 60, Feb. 1957, p. 145-147. (CMA)

A titaniferous iron sand (29.84% TiO_2, 50.44% FeO, 4.80% SiO_2 and 0.18% V_2O_5) was mixed with Na_2SO_4 and coke and roasted at 1100° C. for 2 hr., followed by quenching in cold water. After separation of the water-soluble products, the residue was treated with 10-15% H_2SO_4. 14 ref. (C19; V)

268-C. (Japanese.) **Manufacture of Metallic Sodium From Sodium and Amalgam.** Tutuzo Okadu, Shiro Yoshida and Tokuda Watanabe. *Chemical Society of Japan, Journal,* v. 60, June 1957, p. 666-670.

Research on manufacture of metallic sodium by amalgam concentration cell; the test was carried out in horizontal bath and with a revolving anode. (C29; Na)

269-C. (Polish.) **Problems of Manganese Production.** Jacek Dembowski and Antoni Riesenkampt. *Hutnik,* v. 24, May 1957, p. 192-197.

Obtaining manganese from poor grade ores by thermal, electric and chemical methods; recovery of manganese from openhearth slag. 8 ref. (C general, A11d; Mn, RM-n, RM-q)

270-C. Recovery of Lithium From Complex Silicates. John W. Colton. Paper from "Symposium on Handling and Uses of the Alkali Metals". American Chemical Society, p. 3-8.

Lithium ores of major economic importance are spodumene, lepidolite, Trona concentrates and amblygonite. Processes of recovery of lithium from silicate minerals involve either high-temperature ion substitution reactions or volatilization, and yield the sulphates, carbonates, hydroxides or chlorides. These salts are readily interconvertible. Metallic lithium is made by electrolysis of lithium chloride. 21 ref. (C19, C23p; Li)

271-C. Present and Potential Uses of Sodium in Metallurgy. W. J. Kroll. Paper from "Symposium on Handling and Uses of the Alkali Metals". American Chemical Society, p. 138-154.

The high-intermetallic affinity of sodium for certain elements such as sulphur, arsenic, antimony and bismuth suggests its use as a cleanser for raw metals. Its high halogen affinity recommends it as a reducing agent for producing pure metals and alloys. The reduction of titanium tetrachloride and zirconium tetrachloride with sodium is compared with magnesium reduction. 90 ref. (C26; 17-7, Na)

272-C. From Oxide to Titanium. *Chemical and Engineering News,* v. 35, Sept. 2, 1957, p. 100, 103. (CMA)

The aluminum reduction of titanium is theoretically impossible on thermodynamic grounds, but a recent patent assigned to the Illinois Institute of Technology decribes such a reduction using a 4:1 excess of aluminum to make alumina and a 30-70% alloy of titanium.
(C26; Ti, *Al*)

273-C. Novel Chlorination Furnace Shows Promise. *Chemical Engineering,* v. 64, Sept. 1957, p. 170-172. (CMA)

A furnace of Salem-Brosius, Inc., chlorinates refractory ores (rutile, zircon, spodumene, etc.) on a continuous tonnage basis by sweeping the ore, coke breeze and chlorine through a graphite reactor at 5-150 ft. per sec. The reactor tube is used as a resistor to produce temperatures of 2500-3000° F.
(C19r, 1-2; EG-d, RM-n)

274-C. Equilbrium Between Titanium Metal, $TiCl_2$, and $TiCl_3$ in NaCl-KCl Melts. W. C. Kreye and H. H. Kellogg. *Electrochemical Society, Journal,* v. 104, Aug. 1957, p. 504-508. (CMA)

$TiCl_2$ makes up 87-91% of the dissolved titanium and tetravalent titanium makes up less than 1%. Proportionation between titanium and $TiCl_3$ appears to be exothermic. The equilibrium constant of the reaction was determined as a function of concentration. Analytical procedures used. 7 ref. (C23p; Ti)

275-C. How the Inverted-Bosh Blast Furnace Increases Scrap Smelting Capacity. *Engineering and Mining Journal,* v. 158, Aug. 1957, p. 100-101.

Inverting the bosh on an existing furnace raised copper scrap smelting capacity from 35 to 100 tons per day charge. A new furnace with a similar design is described.
(C21a, 1-2; Cu, RM-p)

276-C. Continuous Casting: Review and Outlook. Rufus Easton. *Journal of Metals,* v. 9, Aug. 1957, p. 1045-1048.

The Asarco and Junghans processes for casting copper and brass; the direct chill process, Properzi, Tessmann, Goss, Hazelett processes for casting aluminum; continuous casting of steel. 28 ref.
(C5q, D9q; Cu, Al ST)

277-C. Separation of Nickel and Zinc From a Mixture of Their Salts: Pt. 2. Reduction of Nickel Oxide. R. A. Sharma, P. P. Bhatnagar and T. Banerjee. *Journal of Scientific and Industrial Research,* v. 16A, June 1957, p. 255-259.

A systematic study of the reaction between nickel oxide and carbon has been taken to procure data to be used in separating nickel and zinc from 4 mixtures of their oxides by carbon reduction. 4 ref. (C28; Ni, Zn)

278-C. Zinc Production in a Blast Furnace. S. W. K. Morgan. *Mining Journal,* v. 249, Aug. 9, 1957, p. 163-165.

Operation and arrangement of zinc blast furnace. Process can be applied to mixed lead-zinc concentrates. No extra carbon is needed for lead production. (C21a; Zn)

279-C. Design and Cost Estimate for a Pyrometallurgical Reprocessing Plant. Louis Basel and Joseph Koslov. *Nucleonics,* v. 15, Aug. 1957, p. 56-60.

Prediction of what the plant, with its high activity, remote handling and shielding will look like. The oxide-slagging method is used and 18,000 kg. of enriched uranium alloy can be processed per year.
(C6c, W12a, 1-2; U)

280-C. Caustic Fusion of Columbite-Tantalite Concentrates With Subsequent Separation of Niobium and Tantalum. James A. Pierret and Harley A. Wilhelm. Iowa State College, *U. S. Atomic Energy Commission,* ISC-796, Aug. 1956, 25 p.

A procedure for the production of spectrographically pure columbium and tantalum oxides from columbite-tantalite concentrates; the procedure involves a caustic fusion process and the separation of tantalum and columbium by liquid-liquid extraction. 32 ref. (C28; Cb, Ta)

281-C. (German.) **Separation of Rare Earths Contained in Cola Concentrates.** Witold Mazgaj. *Chemische Technik,* v. 9, June 1957, p. 350-353. (CMA)

"Cola concentrate", an apatite used as a raw material for the production of phosphoric manures, contains constant amounts (about 0.8%) of rare earths. The rare earth content was separated by treating the apatite with nitric acid, separating the fluorine compounds and neutralizing the remaining free nitric acid and about 50% of the first free hydrogen of the phosphoric acid with $CaCo_3$ calcium carbonate. About 5.5 kg. mixed oxides were obtained from 1 ton of "cola concentrate". 14 ref.
(C19; EG-g)

282-C. (German.) **Welding Rectifiers for the Arc Melting of Titanium and Zirconium.** E. Bergmann. *Elektro-Waerme,* v. 15, Jan-Feb. 1957, p. 38-39. (CMA)

Welding rectifiers of about 2500 amp. rated current used in Europe for the arc melting of titanium and zirconium. The energy required for the melting of titanium ingots of about 16-30 cm. diameter is about 4.5 kw-h. per kg. in a two-stage melting process. For zirconium, due to its lower specific heat and heat of fusion, the energy requirements are lower. 3 ref. (C5h, W29a, 1-2; Ti, Zr)

283-C. (German.) **Elimination of Tin From Tungsten Concentrates.** Ferdinand Kadlec. *Neue Hütte,* v. 2, July 1957, p. 422-425.

Utilizing tin compounds such as $SnCl_2$, SnS and SnO; evaporation of tin as SnO; mixing of the concentrate with coke in rotary kiln. 4 ref. (C general; W, *Sn*)

284-C. (German.) **Experiments on the Openhearth Process.** Milan Jovanovic and Ernst Justus Kohlmeyer. *Zeitschrift für Erzbergbau und Metallhüttenwesen,* v. 10, June 1957, p. 273-284.

A study of the openhearth process at the Zvecan lead smelter (Yugoslavia) with particular reference to the effects of variations in blast volume and pressure, and of impurities in the ore on the optimum furnace output. Furnace output is shown to be directly proportional to the PbS content of the concentrate, the process being unworkable with concentrates containing less than 65% Pb. The presence of even 1% copper in the concentrate will stop the operation. (C21c; Pb)

285-C. (Russian.) **Causes of the Anodic Effect in the Electrolytic Production of Aluminum.** L. N. Antipin and N. G. Turin. *Zhurnal Fizicheskoi Khimii,* v. 31, May 1957, p. 1103-1110.

The anodic effect in cryolite alumina melts owes its appearance to the discharge of fluorine containing ions at the anode. It has been suggested that the compounds COF_2 and CF_4 may form at the carbon anode. The nonwettability effect observed at the anode is caused by the presence of these substances on its surface. 24 ref. (C23; Al)

286-C. Rare Earth Process Gets Trial. *Chemical and Engineering News,* v. 35, Sept. 9, 1957, p. 80. (CMA)

Horizons, Inc. is about to give R. C. Vickery's lanthanon separation method bench-scale trials. The process has a liquid ion exchange basis and uses 1M 2-diethylhexyl phosphoric acid in petroleum ether in contact with an aqueous solution of lanthanon chlorides. By regulating the pH of the ammonium citrate extractant and its weight ratio to the petroleum ether layer, the lanthanons may be preferentially extracted as individuals. (C19s; EG-g)

287-C. Electrolytic Preparation of Titanium From Fused Salts—I. Preliminary Electrolytic Studies With Diaphragmed Cells. M. B. Alpert, F. J. Schultz and W. F. Sullivan. *Electrochemical Society, Journal,* v. 104, Sept. 1957, p. 555-559. (CMA)

An electrolytic process for titanium involves the reduction of $TiCl_4$ to a reduced chloride in a solution of alkali or alkaline earth chloride in a diaphragmed cell. The $TiCl_4$ is added to the cell through a hollow cathode at a controlled feed: current ratio. By controlling the melts most of the dissolved chloride is $TiCl_2$. With an inert atmosphere it is possible to obtain titanium as a coarse dendritic material which, after hydrochloric acid leaching, is readily fabricated. Factors are present for a continuous operation on a large scale. 19 ref. (C23p; Ti)

288-C. Titanium Production in Sheffield. *Engineering,* v. 184, Aug. 23, 1957, p. 235. (CMA)

Building of a titanium-melting plant at Sheffield, England by Wm. Jessop and Sons. Titanium granules from ICI mixed with appropriate amounts of alloying additions are compacted by a press. The compacts are welded into a consumable electrode in a vacuum chamber. The double-melting procedure, employing water-cooled copper crucibles, is described. (C5h; Ti)

289-C. Blast Furnace Production of Zinc. S. W. K. Morgan. *Metal Industry,* v. 91, Aug. 9, 1957, p. 105-108, 111.

Experimental work in development of blast furnace unit and liquid lead condenser; theory of blast furnace smelting and application of process to various zinc-bearing materials. (C21a; Zn)

290-C. Floating Zone Purification. *Metal Industry,* v. 91, Aug. 16, 1957, p. 132.

Application of zone refining to germanium, silicon, iron, titanium, zirconium, nickel and molybdenum, and the use of radioactive tracers for following redistribution and purification. (C28k, 14-13; Ge, Si, Fe, Ti, Zr, Ni, Mo)

291-C. Casting Large Ingots of Uranium. G. W. P. Rengstorff and H. W. Lownie, Jr. *Metal Progress,* v. 72, Sept. 1957, p. 76-78.

Sound ingots, 7 in. diameter, weighing 1200 lb. and with 91 to 95% recovery in metal can be cast in iron molds after induction melting the uranium "derbies" in magnesia or graphite crucibles under open argon atmosphere. A small

amount of barium chloride, added shortly before pouring, protects the stream of molten metal from oxidation. (C5j, 1-2; U)

292-C. Superpurity Nickel Melted Under Controlled Atmospheres. K. M. Olsen. *Metal Progress,* v. 72, Sept. 1957, p. 105-109.

Research work on vacuum-tube "repeaters" for transoceanic cables requires nickel of unexcelled purity. This can be made by melting sintered slugs of carbonyl nickel powder in magnesia crucibles under a definite program of hydrogen, vacuum and helium atmospheres. The process is also effective for high-purity binary nickel alloys and iron alloys. (C5j; Ni-a)

293-C. Metallurgical Applications of Solvent Extraction. J. B. Rosenbaum and J. B. Clemmer. *Mines Magazine,* v. 48, Aug. 1957, p. 21-24.

Principles, techniques, limitations, applications and potential uses in processing ores. Solvent extraction proved ideal for processing irradiated thorium, uranium, and plutonium. 15 ref. (C19, 2-17; Th, U, Pu)

294-C. (French.) **Chromium and Ferrochromium in the Manufacture of Alloy Steels.** M. Dingeon. *Journal du Four Electrique,* no. 3, 1957, p. 87-91.

Review of metallurgical procedures and progress in manufacture of chromium for use in alloy steels. (C21; Cr, AD-n, AY)

295-C. (French.) **Direct Current in Electrochemical Metallurgy.** M. M. Dodero. *Societe Francaise des Electriciens, Bulletin,* v. 7, May 1957, p. 276-284.

Igneous electrolysis has applications in electrometallurgy and electric steelmaking, particularly in manufacture of low-alloy steels. 10 ref. (C23; AY)

296-C. (Italian.) **Refining of Heat Resistant Aluminum-Silicon Hypereutectic Alloys.** S. Gallo. *Fonderia Italiana,* v. 6, July 1957, p. 279-284.

Characteristics of three groups of heat resistant alloys used in manufacture of pistons; refining with phosphorus, titanium and boron; effect of sodium and alkaline salts on refining power of these substances. 13 ref. (C5r; Al, SGA-h, *Si*)

297-C. (Norwegian.) **Kinetic Conditions in Reduction of Oxide Ores.** T. Rosenqvist. *Tidsskrift for Kjemi Bergvesen og Metallurgi,* v. 17, no. 1, 1957, p. 1-6.

A survey of factors affecting the reduction rate; determination of useful reduction rates; experiments on gas velocity, temperature and reduction. 13 ref. (C general, D general, 3-17)

298-C. (Roumanian.) **Vacuum Dezincing of Lead.** I. V. Buda. *Revista de Chimie,* v. 8, Mar. 1957, p. 166-171.

New vacuum heating method; experiments and apparatus; results compared with those of researchers in U.S.A., U.S.S.R., and Australia. (C25; Pb, *Zn*)

299-C. Theory of Blast Furnace Zinc Production. Pt. 2. Zinc Production. S. W. K. Morgan. *Mining Journal,* v. 249, Aug. 16, 1957, p. 193-194.

Pilot production furnaces and theory of process. (C21a; Zn)

300-C. Production of Metallic Lithium on a Laboratory Scale Under Reduced Pressure. T. Szarowicz and M. Orman. *Prace Instytutow Ministerstwa,* v. 7, no. 5/6, 1955, p. 270-275. (*Henry Brutcher Translation* no. 3601.)

Previously abstracted from original. See item 107-C, 1956. (C26, C25, Li)

301-C. (Czech.) **Electrolytic Production of High-Purity Chromium.** Vladmir Dluohy and Jan Kaloc. *Hutnické Listy,* v. 12, no. 6, 1957, p. 509-515.

High-purity chromium prepared by electrolysis of aqueous solution of trivalent and hexavalent chromium salts. Examined influence on yield of bath composition and concentration, electrolyte temperature, current density, relation between surfaces of electrodes, their distance, their material, shape, preparation and arrangement. 19 ref. (C23p; Cr-a)

302-C. The Preparation of Tungsten Carbide. Arthur E. Newkirk and Ifigenia Aliferis. *American Chemical Society, Journal,* v. 79, Sept. 5, 1957, p. 4629-4631.

Tungsten carbide, WC, may be prepared by heating tungstic acid, a blue oxide of tungsten or ammonium paratungstate in a mixture of hydrogen and methane at 850-1000°. With tungstic acid, reduction to tungsten metal is shown to be complete before carburization begins. 8 ref. (C19, W, *C*, 6-19)

303-C. Pressure Leaching of Montana Nickel-Copper Concentrates. G. V. Cullen. *Chemical Engineering and*

Mining Review, v. 49, Aug. 15, 1957, p. 48-51.

Resemblance between ore at Zeehan and Lynn Lake; preliminary pressure leaching tests using ammoniacal solutions. 6 ref. (C19n; Ni, Cu)

304-C. Some Aspects of Reactor Material Technology. Pt. 2. Role of Ion Exchange and Solvent Extraction. John S. Carr. *Chemical Engineering and Mining Review,* v. 49, Aug. 15, 1957, p. 52-57.

Chemical and metallurgical factors in aqueous processes for production, recovery and purification of reactor fuel; ion exchange in recovery of uranium from its ores; solvent extraction for large scale treatment of irradiated reactor fuel. 11 ref. (C19, T11g; U)

305-C. Large Titanium Ingot Production. *Light Metals,* v. 20, Sept. 1957, p. 291-292. (CMA)

Ingots up to 20-in. diameter are produced which weigh one ton. Alloy development led to the production of five "Hylite" alloys, the most complex of which has good mechanical and creep strength up to 450-500° C. Melting operations (double) are described. (C5; Ti, 5-9)

306-C. Vacuum Induction Melting—Process Considerations. W. E. Jones. *Metal Progress,* v. 72, Oct. 1957, p. 133-138, 220.

Successful vacuum melting requires very high vacuums, leak-tight equipment, pure melting stock and crucible materials. Reactive metals added at the end of the heat then alloy with the melt rather than form undesirable inclusions. Notable improvements result in high-temperature properties of heat resistant alloys. (C5, 1-23; SGA-h, Ni, Co, Fe, 5-9)

307-C. The Machinability Concept. K. G. Lewis. *Metal Treatment and Drop Forging,* v. 24, Aug. 1957, p. 331-334.

Relationship between machining performance and chip formation, intermittent cutting, hardness. (To be concluded.) 24 ref. (G17k)

308-C. Extraction and Purification of Plutonium Metal. *Platinum Metals Review,* v. 1, Oct. 1957, p. 132-133.

Extraction of plutonium from irradiated uranium and its subsequent purification at the Windscale Works of the United Kingdom Atomic Energy Authority. (C19; Pu)

309-C. Niobium Refined. *Chemical and Engineering News,* v. 35, Oct. 28, 1957, p. 48-50.

Cage zone melting. (C28k; Cb)

310-C. New Smelting Technique Uses Blast Furnace to Recover Zinc and Lead. S. W. K. Morgan. *Mining World,* v. 19, Oct. 1957, p. 58-63.

Direct smelting to liquid zinc treats both zinc and mixed sulphide ores and concentrates to yield metallic zinc. Lead content of charge, as well as silver, gold, antimony and small amounts of copper, are simultaneously recovered as lead bullion. Copper, when present in appreciable amount, is recovered as matte, whether lead is being tapped or not. Zinc recovery as a metal is 89% of zinc volatilized; remaining zinc is periodically recovered in dross and blue powder. Charge free from fines is essential; sinter has proven satisfactory. (C21a; Zn, Pb)

311-C. How Mitsubishi Uses Automatic Furnace Control at Naoshima Copper Smelter. Sei Arakane. *Mining World,* v. 19, Oct. 1957, p. 73-78.

Features of smelter equipped with only copper reverberatory furnace in Orient; heat, fuel, combustion control systems; problems of maintenance of furnace and its roof; installation of horizontal suspended roof; zinc fuming copper slag. (C21, W18r, 1-2; Cu)

312-C. Zirconium Ingots Arc Melted From Various Types of Zirconium Scrap. E. S. Foster and W. J. Hurford. Westinghouse Atomic Power Division. *U. S. Atomic Energy Commission,* WAPD-RM-96, Nov. 13, 1951, 7 p. (CMA)

Ingots were arc melted from such zirconium scrap as machining chips, turnings, hot rolled strip tailings and "picture frame" cores. Ingots melted satisfactorily with regard to cleanliness and splatter. The hardness of the ingots comes from contamination in the scrap. (C5h, A11d; Zr, RM-p)

313-C. Development of a Method for Consumable Arc Melting Crystal Bar Hafnium. J. G. Goodwin and W. J. Hurford. Westinghouse Atomic Power Division. *U. S. Atomic Energy Commission,* WAPD-RM-216, Jan. 8, 1954, 18 p. (CMA)

Three approaches to melting hafnium were studied, of which the Bureau of Mines and WAPD approaches were consumable arc melt-

ing. Advantages and disadvantages of each. It is recommended that a method be devised to eliminate nonconsumable melting, and that double length hafnium ingots be melted. 4 ref. (C5h; Hf)

314-C. Preliminary Process Specification for Melting Uranium-12 Molybdenum Alloy. F. R. Lorenz. Westinghouse Atomic Power Division. *U. S. Atomic Energy Commission,* WAPD-FE-681, Mar. 1, 1955, 5 p. (CMA)

Specifications for the vacuum induction melting and consumable remelting of U-12Mo. Furnaces and other equipment specified are described. The vacuum induction cast electrode is pickled in nitric acid solution, threaded onto the electrode lead, and is arc-melted to an ingot in the presence of a helium-argon mixture. (C5j, 1-23, C5h; U, *Mo*)

315-C. Solvent Extraction Equilibria for Rare Earth Nitrate-Tributyl Phosphate Systems. L. L. Knapp, Morton Smutz and F. H. Spedding. Iowa State College. *U. S. Atomic Energy Commission,* ISC-766, Aug. 1957, 39 p. (CMA)

Effects on the equilibrium data of the TBP-lanthanon nitrate system of such process variables as concentration of acid and lanthanons. Distribution data were obtained for individual lanthanons in systems containing no nitric acid or salting-out agents. 19 ref. (C19; EG-g)

316-C. Physical Chemistry of NaCl-KCl Melts Containing Dissolved Titanium Chlorides. W. C. Kreye, et al. Columbia University, School of Mines, Report Under Contract N onr-266(24). *U. S. Office of Technical Services,* PB 125907. June 1956, 49 p. (CMA)

The equilibrium among titanium, $TiCl_3$ in NaCl-KCl melts and titanium and $TiCl_4$ alone in these melts were studied. Much of the work was in establishing analytical procedures for titanium chlorides in the melt. (Clp; Ti)

317-C. (German.) **Metallurgy of Titanium.** Paul Ehrlich. *Chemie-Ingenieur-Technik,* v. 29, Sept. 1957, p. 557-562. (CMA)

Reduction of titanium tetrachloride (Kroll process and reduction by sodium), the thermal dissociation and rearrangement of halides, and fusion electrolysis (electrolysis of oxides, of halides and with soluble anodes). 52 ref. (Clp; Ti)

318-C. (German.) **Flin Flon Copper-Zinc Mine (Canada).** Reinhard Kleinert. *Zeitschrift für Erzbergbau und Metallhüttenwesen,* v. 47, Aug. 1957, p. 383-391.

Description of deposits; copper leaching plant and furnaces; zinc concentration and refining; cadmium treatment. (C19, C general; Cu, Zn, Cd)

319-C. (German.) **Application of Pressure Extraction on Ores and Intermediate Products.** Franz Pawlek and Hartmut Pietsch. *Zeitschrift für Erzbergbau und Metallhüttenwesen,* v. 10, Aug. 1957, p. 373-383.

Kinetics of oxidation pressure extraction examined for copper-nickel charges. In a neutral atmosphere pressure oxidation can produce elementary sulphur from sulphides. Method could be applied to zinc-sulphate solutions, and to various zinc concentrates and ores with up to 80% yield of zinc. 16 ref. (C19; Cu, Ni, RM-n)

320-C. (Russian.) **Effect of Vanadium on the Solubility of Oxygen in Iron-Carbon Melts.** R. A. Karasev, A. Y. Polyakov and A. M. Samarin. *Akademiya Nauk S.S.S.R., Izvestiya Otdelenie Tekhnicheskikh Nauk,* no. 2, Feb. 1957, p. 146-150. (CMA)

With a view to establishing optimum conditions for the extraction of vanadium during the treatment in a converter of iron-carbon melts rich in vanadium, a series of experimental treatments were made which demonstrated the essential difference between the slow oxidation of the metal surface in air and the process taking place in the converter under the action of the blast. (C21; V, Fe)

321-C. (Russian.) **Extraction of Vanadium From Blast Furnace Pig Iron With High Phosphorus Content.** A. Yu. Polyakov and A. M. Samarin. *Akademiya Nauk S.S.S.R., Izvestiya Otdelenie Tekhnicheskikh Nauk,* no. 6, June 1957, p. 18-26. (CMA)

Blast experiments in magnesite crucibles covering conditions governing the devanadizing of iron from ores with a high phosphorus content showed that it is possible to obtain viscous slags with at least 3.5% V from liquid iron with 0.068% V (and 1.906% P). The process, lasting 20-35 min. (the duration increasing with vanadium content in the initial material), was conducted at the relatively low temperature of 1150-1250° C.) (C21; V, RM-q)

322-C. (Russian.) **Preparation of Molybdenum Disilicide by Reduction of Oxides With Carbon.** L. Ya. Markovskii and N. V. Vekshina. *Zhurnal Neorganicheskoi Khimii,* v. 2, July 1957, p. 1694-1696. (CMA)

At stoichiometric proportions of the components the reaction $MoO_3 + 2SiO_2 + 7C \rightarrow MoSi_2 + 7CO$ leads to the formation of side products like Mo_5Si_3 and SiC, while some carbon remains unused. However, it was possible to develop a satisfactory procedure for preparing $MoSi_2$ by introducing an excess of SiO_2 and heating to 1900° C. 8 ref. (C19; Mo, *Si*)

323-C. (French.) **Separation of Some Rare Earth Elements by the Dry Method. Case of Samarium and Europium.** J. C. Achard. *Comptes Rendus,* v. 245, Sept. 23, 1957, p. 1064-1066. (CMA)

Samarium and europium are separated from other lanthanons by reacting carbon with a mixture of oxides at high temperature and low pressure. 5 ref.
(C28; Sa, Eu)

324-C. (Italian.) **Molybdenum in Some Italian Zinc Blendes and in the Process of Electrolytic Extraction of Zinc.** Giovanni Scacciati. *Chimica e l'Industria,* v. 38, May 1956, p. 393-397.

Cycle of electrolytic extraction of zinc was studied in connection with two blendes having different proportions of molybdenum. Behavior and influence of molybdenum in precipitation of zinc from calcined blende, cementation of cadmium with zinc powder, electrolytic deposition of zinc, recovery of cadmium. 9 ref. (C23n, 2-10; Zn, *Mo*)

325-C. (Russian.) **Interaction Between Titanium Tetrachloride and Chlorides of Tantalum, Columbium and Aluminum.** I. S. Morozov and D. Ya. Toptygin. *Zhurnal Neorganicheskoi Khimii,* v. 2., Aug. 1957, p. 1915-1921. (CMA)

Chlorides of Ta, Cb and Al are obtained during the preparation of titanium tetrachloride from some titanium ores. Mutual solubility of these chlorides is examined. 7 ref. (C1p, P12e; Ti)

326-C. (Russian.) **Solubility of Ferric Chloride, and of Its Melts With Chlorides of Columbium, Aluminum and Sodium, in Titanium Tetrachloride.** I. S. Morozov and D. Ya. Toptygin. *Zhurnal Neorganicheskoi Khimii,* v. 2, Sept. 1957, p. 2129-2135. (CMA)

Industrial preparation of $TiCl_4$ from the rare-earth-containing varieties of titanium ores involves separation of titanium tatrachloride from chlorides of Fe, Al and Cb. Furthermore, mixtures of $FeCl_3$ and NaCl are used for removing $FeCl_4$ from $TiCl_4$. Systems composed of these chlorides are investigated with the aid of thermal analysis.
(C1p; Ti)

SECTION D

FERROUS REDUCTION and REFINING

1-D. More Iron Without More Furnaces. II. Increasing the Driving Rate. Charles M. Squarcy and Richard J. Wilson. *Steel,* v. 139, Nov. 26, 1956, p. 98 + 4 pages.

Experience with high top pressure furnaces; effects of oxygen-enrichment and steam injection; other factors affecting production rate. (D1h; Fe)

2-D. More Iron Without More Furnaces. I. Lowering the Coke Rate. Charles M. Squarcy and Richard J. Wilson. *Steel,* v. 139, Nov. 19, 1956, p. 150 + 5 pages.

Several alternative methods are suggested to increase blast furnace production by lowering coke rate and increasing driving rate. (D1h; Fe)

3-D. Vanadium in Acid Steelmaking Process and Deoxidizing Power of Vanadium. I. A. Popov and B. V. Stark. *Henry Brutcher Translation No.* 2843-B, 12 p. (From *Izvestiya Akademii Nauk SSSR, OTN,* no. 2, 1951, p. 261-266.) Henry Brutcher, Altadena, Calif.

Previously abstracted from original. See item 220-D, 1951. (D11r; ST, V)

4-D. Effect of Mold Wall Thickness Upon Solidification of Ingots. N. N. Rubtsov and G. F. Balandin. *Henry Brutcher Translation No.* 3209, 17 p. (From *Liteinoe Proizvodstvo, 1952,* no. 4, Apr. 1952, p. 16-19.) Henry Brutcher, Altadena, Calif.

Solidification time for steel ingots as a function of thickness of gray iron mold; variation in temperatures of outside and inside mold walls during solidification of steel ingots. Calculations using the method of successive approximations. (D9; ST)

5-D. Effect of Addition of Metallic Bismuth to Liquid Steel. V. S.Bozhko. *Henry Brutcher Translation No.* 3216, 5 p. (From *Trudy Instituta Chernoi Metallurgii,* v. 7, 1953, p. 54-56.) Henry Brutcher, Altadena, Calif.

Influence of additions in the ladle, mold or bottom-pouring mechanism upon casting properties, nonmetallic inclusions and mechanical characteristics. (D9; Bi, ST)

6-D. Lining of Top-Blown Oxygen Converters at Donawitz (Austria) Steelworks. A. Wegscheider. *Henry Brutcher Translation No.* 3783, 14 p. (Abridged from *Stahl und Eisen,* v. 76, no. 10, 1956, p. 595-599.) Henry Brutcher, Altadena, Calif.

Previously abstracted from original. See item 248-D, 1956. (D10; NM-h, ST)

7-D. Development and Industrial Application of Continuous Casting of Steel. M. S. Boichenko, V. S. Rutes and N. A. Nikolaev. *Henry Brutcher Translation No.* 3818, 18 p. (Abridged from *Stal',* v. 16, no. 6, 1956, p. 505-513.) Henry Brutcher, Altadena, Calif.

Previously abstracted from original. See item 315-D, 1956. (D9q; ST)

8-D. Industrial-Scale Trials on the Injection of Argon for Flushing Hydrogen Out of Arc on O. H. Steel Baths. M. Imai, T. Nakayama and H. Ol. *Henry Brutcher Translation No.* 3827, 5 p. (Abridged from *Tetsu to Hagane,* v. 41, no. 9, Sept. 1955, p. 1033-1034.) Henry Brutcher, Altadena, Calif.

Effect of argon flushing shortly before the tap on hydrogen content of chromium steels and plain carbon steels. Bath compositions before argon injection, data on procedure in treating baths with argon. (D2g, D5g; A, AY, CN)

9-D. (Czech.) **Thermal Effect of Artificially Moistened Wind on the Processes in the Blast Furnace Hearth.**

Miroslav Prouza. *Hutnické Listy,* v. 11, no. 10, Oct. 1956, p. 577-579.

Effect of humid air on heat balance of blast furnace hearth. Use of vapor is inseparably combined with the preheating of air to high temperature. (D1h, D11k; Fe)

10-D. (Czech.) **Treatment of Stainless Scrap With Oxygen in Openhearth Furnace.** V. Cerny and Zdenko Zdenek. *Hutnické Listy,* v. 11, no. 11, no. 10, Oct. 1956, p. 579-583.

Chromium-nickel and chromium-nickel-molybdenum wastes treated with oxygen in the openhearth furnace can be easily rolled and have good corrosion resistance. (D2g, B23; SS)

11-D. (German.) **Slag Regulation During the Production of Manganese-Rich Pig Iron in the Low-Shaft Blast Furnace.** Georg Brückner. *Neue Hütte,* v. 1, no. 8, Sept. 1956, p. 449-456.

Influence of slag components upon melting heat, melting temperature and viscosity. Optimum slag composition and other variables. (D8p; NM-p, Fe)

12-D. (German.) **Production of High Quality Steel in Blast Converter.** Kurt Rösner and Alfred Wegscheider. *Stahl und Eisen,* v. 76, no. 21, Oct. 18, 1956, p. 1337-1343.

Refining, decrease of sulphur content, production of carbon-free steel in blast converter. (D8; ST)

13-D. (Russian.) **Iron Ion Transport Numbers in Molten Iron Silicates.** O. A. Esin and A. K. Kir'ianov. *Izvestiia Akademii Nauk SSSR, Otdelenie Tekhnicheskikh Nauk.* no. 8, Aug. 1956, p. 20-27.

Methods and design of electrolyzer for determining transport numbers of cations of iron in molten slag of varying composition. Conductivity of molten slag. (D11n; Fe)

14-D. (Russian.) **"Evaporation" of Iron During Blow of Pig Iron in Converters.** P. Ia. Sorokin. *Izvestiia Akademii Nauk SSSR, Otdelenie Tekhnicheskikh Nauk,* 1956, no. 8, Aug. 1956, p. 28-36.

Ejection of iron oxide particles from the bath surface during blowing of pig iron in Bessemer converters. Mechanism of oxidation of elements during blow. (D3; Fe)

15-D. (Russian.) **Teeming of Steel With Arc-Heating of Deadhead.** B. N. Popov. *Metallurg,* no. 9, Sept. 1956, p. 19-22.

Method and installation for arc heating, economics and advantages for rolling. (D9; ST)

16-D. (Russian.) **Use of Fluxes to Reduce Slag Viscosity in Casting Molds When Teeming Rimmed Steel.** K. S. Alferov, V. O. Kulikov and T. G. Kovaleva. *Metallurg,* no. 9, Sept. 1956, p. 22-24.

Addition of flux, like ground glass, to reduce slag area on rimmed steel; its intrusion into the steel. (D9; NM-p, ST)

17-D. **A Metallographic and Mineralogical Study of a Basic Openhearth Heat.** Peter M. Power and John C. Campbell. *Canadian Mining and Metallurgical Bulletin,* v. 49, no. 535, Nov. 1956, p. 793-802.

As various impurities in the bath are oxidized, the metal structure changes from that of high-phosphorus white cast iron to that of low-carbon steel. Phosphorus distribution was studied. The acid run-off slag has an acicular orthosilicate structure which changes on "shape-up" to a very basic tricalcium silicate and calcium ferrite structure. (D2, D11r; ST)

18-D. **Heat Transfer in the Openhearth Furnace. II.** M. W. Thring. *Industrial Heating,* v. 23, Nov. 1956, p. 2384, 2386, 2388, 2390.

The effects of various improvements in furnace operation on the calculations are considered and comparison is made between calculated thermal efficiency and efficiency actually observed. (D2, D11k)

19-D. **Some Methods for Analyzing and Controlling an Openhearth Operation.** Eugene H. Swett. *Iron and Steel Engineer,* v. 33, Nov. 1956, p. 109-113.

Statistical analysis of certain variables illustrates their effect upon production rate or product quality. (D2, S12)

20-D. **Equilibria in Reactions of Hydrogen and Carbon Monoxide With Dissolved Oxygen in Liquid Iron; Equilibrium in Reduction of Ferrous Oxide With Hydrogen, and Solubility of Oxygen in Liquid Iron.** Nev A. Gokcen. *Journal of Metals,* v. 8; *American Institute of Mining and Metallurgical Engineers, Transactions,* v. 206, Nov. 1956, p. 1558-1567.

Results are expressed in thermodynamic functions and correlated with new data on the standard free energies of H_2, H_2O, O_2, CO and CO_2. (D11r, P12a; ST)

21-D. **Hydrogen in Steelmaking Slags.** J. H. Walsh, J. Chipman, T. B. King and N. J. Grant. *Journal of Metals,* v. 8; *American Institute of Mining and Metallurgical Engineers, Transactions,* v. 206, Nov. 1956, p. 1568-1576.

Slag and metal samples from a number of industrial heats were analyzed and the important role of the slag in determining the hydrogen content of the metal was confirmed. (D11n; NM-p)

22-D. (German.) **Investigations for Testing the Behavior of Ores in the Blast Furnace.** Jacob Willems, Peter Dickens and Wilhelm vor dem Esche. *Stahl und Eisen,* v. 76, no. 22, Nov. 1, 1956, p. 1404-1409.

Studies expansion and softening values of ores and sinters and the mineralogical structure of the ores. (D1; ST, AD-s36)

23-D. (German.) **Nonmetallic Deposits on the Sprue and Wear of Runner Bricks With Killed Openhearth Steels.** Karl Georg Speith, Hans vom Ende and Hans-Joachim Seelisch. *Stahl und Eisen,* v. 76, no. 22, Nov. 1, 1956, p. 1426-1441.

Tests with runner bricks having different alumina contents for pouring soft and medium hard killed steels. (D9n; NM-h, ST)

24-D. The Changing Open-Hearth Picture. Kenneth C. McCutcheon. *Blast Furnace and Steel Plant,* v. 44, Dec. 1956, p. 1411-1416.

Comparison of 1947 with 1956 operating data. (D2; ST)

25-D. Sponge Iron and H-Iron for Electric Furnace Charging. P. E. Cavanagh. *Journal of Metals,* v. 8, Dec. 1956, p. 1642-1644.

Use of virgin melting stock means lower furnace operating costs, lower rolling, forging and annealing costs, and improved customer relations resulting from a known and uniform quality steel. (D5; Fe)

26-D. Desiliconized Pig Iron for the Electric Furnace—A Possibility. S. L. Case. *Journal of Metals,* v. 8, Dec. 1956, p. 1645.

Advantages of desiliconizing the pig before charging make an important difference in costs. (D5; CI)

27-D. (English.) **On Heredity of Pig-Iron. II. Effects of Various Gas Bubblings Into Molten Pig Irons.** Ichiro Iitaka, Kokichi Nakamura and Masao Kikuchi. *Castings Research Laboratory, Report, Waseda University,* 1956, no. 7, p. 1-5.

Experiments with hydrogen and oxygen. Comparisons with magnesium additions. (D1d; Fe)

28-D. (German.) **The Causes of Blast Furnace Explosions and Conclusions to be Drawn for the Design and Operation of Blast Furnaces.** Werner Feldmann. *Stahl und Eisen,* v. 76, no. 23, Nov. 15, 1956, p. 1541-1553.

Explosions are dependent on the blast furnace operation. Safety measures to be taken. (D1b, A7p, 18-17)

29-D. (Russian.) **The Structure of Magnetite in the Reaction Diffusion Layers in the Reduction of Hematite.** V. I. Arkharov and V. N. Bogoslovskii. *Fizika Metallov i Metallovedenie,* v. 3, no. 2, 1956, p. 254-268.

Details of the reduction process gained by studying the peculiarities of the structure of the magnetite phase. Regulating the kinetics of iron oxide reduction. (D11r, M27; Fe, 14-9)

30-D. (Russian.) **Overheating of Side-Blown Converter Steel.** V. A. Fuklev and L. K. Grakhov. *Liteinoe Proizvodstvo,* no. 10, Oct. 1956, p. 9-10.

Overheating of steel in relation to silicon and carbon contents. (D3f; ST)

31-D. (Russian.) **New Investigation of the Coke-Combustion Process in Tuyere Area of a Blast Furnace.** M. Ia. Ostroukhov and L. Z. Khodak. *Stal',* v. 16, no. 10, Oct. 1956, p. 867-872.

Study of the vortex character of gas motion in the oxidation zone. Useful data for operation. (D11k, D1b; Fe, NM-q38)

32-D. (Russian.) **Feeding Oxygen in the Jet of a High-Capacity Open-hearth Furnace During Remelting of Phosphorus Cast Iron.** *Stal',* v. 16, no. 10, Oct. 1956, p. 875-882.

Introduction of oxygen results in reduction of smelting time, and a 17% increase in furnace capacity with no detrimental effect on steel quality. (D2q; ST)

33-D. (Russian.) **Processes of Solidification and Heat Transfer Under Conditions of Continuous Teeming.** *Stal',* v. 16, no. 10, Oct. 1956, p. 883-890.

Application of thermohydraulic integrator for determination of optimum working parameters. (D9p, X9; ST)

34-D. (Russian.) **Using Oxygen in Electric Steel Melting.** N. I. Shutkin. *Stal',* v. 16, no. 10, Oct. 1956, p. 890-894.

Oxygen introduction permits a 30-35% increase in capacity and a 35-50% decrease in electrical energy consumption with no detriment to the metal quality. (D5q; ST)

35-D. (Russian.) **Calculation of Self-Sintering Electrode Diameters of Ore-Reducing Electric Furnaces.** E. M. Alekseev. *Stal',* v. 16, no. 10, Oct. 1956, p. 894-896.

Relation between current density and the specific consumption of the electrode mass. (D8n; ST)

36-D. (Russian.) **The Operation of Blast Furnaces With Gas at a Gauge Pressure of 0.8.** P. F. Sergeev and N. I. Vasil'chenko. *Stal',* v. 16, no. 11, Nov. 1956, p. 963-971.

Increasing output, lowering coke consumption and reducing flue dust by raising the pressure of the gas at the throat of the blast furnace. Equipment required and changes made. (D1h; Fe)

37-D. (Russian.) **Reducing Rimmed Steel in the Ladle With Ferromanganese.** I. I. Bornatskii, K. S. Alferov and V. I. Prilepskii. *Stal',* v. 16, no. 11, Nov. 1956, p. 977-983.

Test results indicate that the method produces satisfactory metal with an average saving in ferromanganese of about 22%.
(D9r; ST, AD-n)

38-D. (Russian.) **Using Compressed Air in Openhearth Furnaces.** V. N. Kazantsev. *Stal',* v. 16, no. 11, Nov. 1956, p. 984-988.

Using compressed air at a pressure of 4 atmospheres shortens the smelting process to 40-50 min. Description of burners, operating pressures and conditions. (D2h; ST)

39-D. Development of Continuous Casting at Atlas Steels, Ltd. William W. Jacobs. *Iron and Steel Engineer,* v. 33, no. 12, Dec. 1956, p. 92-97.

A number of automatic controls developed, size of mold changed, information on solidification developed, and a method of adding aluminum to the mold. (D9q, D9r; ST)

40-D. Sound Steel Without Hot Tops at Green River Steel Corp. George A. Dornin, Jr. *Iron and Steel Engineer,* v. 33, No. 12, Dec. 1956, p. 125-133.

By the use of a process which starts with a short and squatty ingot in casting operation, pipe and segregation are minimized. The quality, design and forging process in connection with squatty ingots.
(D9k, F22, ST, 9-17, 9-19)

41-D. Influence of Manganese on the Desulphurization of Pig-Iron. R. A. Hacking and E. A. Shanahan. *Iron and Coal Trades Review,* v. 158, Dec. 14, 1956, p. 1427-1432.

Sulphur is a serious problem because of the necessity for using lower grade ores; manganese sulphide flotation is helpful in some instances. 14 ref.
(D11, CI-a, *Mn,* AD-a)

42-D. Attack on Open-Hearth Refractories by Iron Oxide: Effect of Contaminants. A. W. Archibald. *Iron and Coal Trades Review,* v. 158, Dec. 14, 1956, p. 1443-1446.

Mechanism of the attack of iron oxide on silica bricks. Wear is caused primarily by slag droplets (iron oxide) dissolving silica.
(D2; RM-h)

43-D. Oxygen in Iron and Steel Production. D. J. O. Brandt. *Iron and Coal Trades Review,* v. 158, Dec. 14, 1956, p. 1451-1452.

Oxygen can be added to inferior gaseous fuels to enrich the flame of openhearth furnaces. Bessemer converters using oxygen are able to make high-quality steel.
(D10, D2g; ST)

44-D. Automatic Stock-Level Control on Blast-Furnaces. I. Kjellman and K. Gronblad. *Iron and Steel,* v. 29, Dec. 8, 1956, p. 588-589.

A mechanical intermittent system with cam-operated contact gear for movement-translating. (D1b, 18-24)

45-D. Measurement of Gas Transit Time in a Blast Furnace. T. W. Johnson. *Iron and Steel,* v. 29, Dec. 8, 1956, p. 590-592.

Sampling system using radioactive tracers is described.
(D1b, S11q, S11r)

46-D. Studies of Blast Furnace Assessment. J. M. Ridgion and A. M. Whitehouse. *Iron and Steel,* v. 29, Dec. 8, 1956, p. 592-595.

Statistical study of the routine operating data having influence on fuel consumption and productivity.
(D1b, S12)

47-D. Total Heat of Commercial Steels. J. R. Pattison. *Iron and Steel,* v. 29, Dec. 8, 1956, p. 599-600.

Total heat of seven carbon steels between 0° and 650° C. Data for silicon steels, alloy steels.
(D11; AY, *Si*)

48-D. Design of Ingots. Principles for High Output in the Slabbing Mill. H. G. Jones, P. D. Dickerson and D. T. Steer. *Iron and Steel,* v. 29, Dec. 8, 1956, p. 612-613.

Effect of ingot width, thickness and height. (D9, 5-9, 17-1; ST)

49-D. Steelmaking, and Forum of Technical Progress. *Steel,* v. 140, Jan. 7, 1957, p. 218-242.

Thirty-three of the industry's leaders contribute brief notes to outline recent developments and the direction of future progress. Among

the many developments mentioned are continuous casting for carbon steel, more use of rare earths and increased number of oxygen converters. (D general; ST)

50-D. Developments in Open Hearth Operations. L. S. Moore. *Blast Furnace and Steel Plant,* v. 45, Jan. 1957, p. 48-49.

Trends and developments in furnace construction, refractories, raw materials, combustion and controls. (D2, W18)

51-D. Current Electric Furnace Practices at Atlantic Steel Company. Z. E. Willbanks. *Blast Furnace and Steel Plant,* v. 45, Jan. 1957, p. 50-52.

Charging, melting and refining practices and refractories used at Atlantic Steel Co. (D5)

52-D. More Iron Without More Furnaces. Charles M. Squarcy and Richard J. Wilson. *Blast Furnace and Steel Plant,* v. 45, Jan. 1957, p. 53-62.

Methods for improving blast furnace production are: use of sized ore, sinter, quality coke and high top pressure. Discusses use of oxygen and steam blast enrichment. 11 ref. (D1h)

53-D. Exothermics Raise Ingot Yields. G. N. Cherry. *British Steelmaker,* v. 23, Jan. 1957, p. 12-15.

Improvements in hot top linings and mold design in order to minimize cropping losses. (D9k, W19; ST)

54-D. Sulphurization From Fuel Oil. B. Trentini, A. Peters and G. Husson. *Iron and Steel,* v. 30, Jan. 1957, p. 11-17.

Investigation in basic openhearth fired by oils with varied sulphur content indicated a practically linear relationship between oil sulphur content and sulphur content in final steel. Sulphurization due to oil ceased when bath was completely covered with slag. Equality of sulphur partition coefficients indicated a near equilibrium in the distribution of sulphur between metal and slag phases. 17 ref. (D11n; ST, RM-k)

55-D. The Direct Measurement of the Total Heat in Open-Hearth Furnaces. A. M. Godridge and G. G. Thurlow. *Journal of the Iron and Steel Institute,* v. 185, Jan. 1957, p. 46-53.

Principle of the total heat meter and possible future uses. 6 ref. (D2h, X9)

56-D. An Investigation of the System $2FeO.SiO_2$-$3Na_2O.P_2O_5$-$Na_2O.2SiO_2$. C. Bodsworth and W. R. Maddocks. *Journal of the Iron and Steel Institute,* v. 185, Jan. 1957, p. 75-82.

Two quasi-binary systems forming part of the ternary system were investigated and a diagram of the ternary system constructed. No evidence could be found in X-ray patterns of the existence of stable ternary compounds. 12 ref. (D11n; RM-q)

57-D. Enriched Blast in Basic Steelmaking. Pierre Coheur and H. Kosmider. *Metal Progress,* v. 71, Jan. 1957, p. 67-72.

Europeans find that the use of oxygen-enriched blast with or without supplementary oxygen through the converter's mouth speeds the steelmaking progress, consumes more scrap, utilizes offgrade pig iron, and broadens the applications of the steel produced. (D3f, 1-15; ST)

58-D. Scrap, Ingots, Smoke and Silicon. *Steel,* v. 140, Jan. 14, 1957, p. 78-81.

Electric furnace steelmakers discuss scrap prices, inoculation with ferrochrome powder, hot tearing relationships, smoke control and desiliconization. (D5; RM-p, ST)

59-D. Oxygen in British Steelmaking. D. J. O. Brandt. *Steel Review,* no. 5, Jan. 1957, p. 43-48.

Oxygen has recently become available at a price and in quantities which make it a practical alternative as an oxidizing agent for refining steel. Principal applications are in prerefining and lancing. (D1h, D2g, D10)

60-D. (German.) **The Treatment on a Large Scale of Steel Melts Under Reduced Pressure.** F. Harders, H. Knueppel and K. Brotzmann. *Stahl & Eisen,* v. 76, Dec. 27, 1956, p. 1721-1728.

Theoretical principles of treating steel melts under reduced pressure. Design of a pilot plant. Gas removal during the vacuum treatment. Quality of vacuum-treated steels. Description of equipment for operation within the openhearth and basic converter steel plant. Effects of a subsequent vacuum treatment on the operation of a steel plant. 15 ref. (D8m; ST)

61-D. Coming Revolution in Steel-Making. *Engineering and Mining Journal,* v. 158, Jan. 1957, p. 99.

Cyclosteel process eliminates sintering, coking plants, blast furnaces, pelletizing and fluxing. (D8; ST)

62-D. Basic Bessemer Steel Blown With Mixture of Oxygen and Carbon Dioxide. *Iron and Coal,* v. 173, Dec. 28, 1956, p. 1539-1541.

The installation, mode of operation and analysis. Steel was regularly produced with nitrogen of 0.004% and below. (D3f; ST-g, 1-15)

63-D. The Special Steelmaker and Power Generation. Charles Sykes. *Iron and Coal,* v. 173, Dec. 28, 1956, p. 1543-1548.

On the metallurgical aspects, present and future problems of power generation with special reference to the manufacture of special steels. (D general, W11)

64-D. Pre-Refining of Blast-Furnace Metal; System in Use at Maximilanshütte, Germany. *Iron and Coal,* v. 173, Dec. 28, 1956, p. 1553-1554.

Increase of molten metal temperature, rapid silicon removal in oxygen pre-refining. (D1h; Fe)

65-D. Iron and Steel Production in Countries Poor in Raw Materials. *Iron and Coal Trade Review,* v. 173, Dec. 21, 1956, p. 1489-1492.

Low-shaft furnaces, rotary furnaces, electric reduction furnaces, pig iron for the steelmaking process, present and future development. (D8n, D8p, D8q; CI-a)

66-D. The "Kaldo" Rotary Oxygen Steelmaking Process. Bo Kalling and Felko Johansson. *Iron and Coal Trade Review,* v. 173, Dec. 21, 1956, p. 1497-1499.

Application and advantages of Swedish rotary furnace. (D10; ST)

67-D. Oxygen in Steelmaking. *Mechanical World and Engineering Record,* v. 137, Jan. 1957, p. 28-30.

Using oxygen instead of air or iron ore for openhearths, furnaces, superior castings, eliminating silicon, refining processes and arc furnaces. (D general; ST, *O*)

68-D. (French.) **The Solubility of Thomas Slag in Citric Acid.** A. Decker, A Delsa and R. Servin. *Revue Universelle des Mines, de la Mécanique, de la Métallurgie,* v. 99, Dec. 1956, p. 652-660.

Factors governing solubility; influence of chemical elements customarily used in solutions; influence of ground fineness of slag on solubility. (D11m; RM-q, ST-g)

69-D. Manufacture of Special Steels. G. Reginald Bashforth. *British Steelmaker,* v. 23, Feb. 1957, p. 42-48.

Instrumentation, hearth construction and maintenance, charging technique, quality control, melt and slag control, charging procedure, choice of deoxidizers and steel for deep drawing. (D general; ST)

70-D. Basic Bessemer Phosphorus—Relationships With Fe in Slag and O_2 During Final Blow. H. v. Ende and G. Mahn. *Iron and Steel,* v. 30, Feb. 1957, p. 61-63.

A relationship between iron content of the slag, the phosphorus content of the bath and corresponding temperature; increasing amount of iron will go into the slag while the phosphorus content is being decreased. At uniform phosphorus contents an increasing amount of iron will go into the slag with increasing temperature. The temperature was measured with an immersion thermocouple. (D3, 1-15, D11n; Fe)

71-D. Oxygen Speeds Sulphur Removal. *Steel,* v. 140, Feb. 18, 1957, p. 158, 161.

Outlines slag control method for sulphur removal in oxygen reclining procedure with openhearth giving shorter refining time. (D2g)

72-D. (French.) **Industrial Reduction of Iron Ores by Hydrogen.** André Roos. *Génie Civil,* v. 134, Jan. 15, 1957, p. 36-39.

Results of laboratory experiments and industrial applications relating to this process of reduction. (D8j; Fe)

73-D. (French.) **Comparison of the Different Methods of Pulverizing Mazut for the Martin Furnace.** G. Husson, A. Peters, R. Kissel and G. Jomier. *Institut de Recherches de la Siderurgie, Publications,* Ser. A, no. 128, Dec. 1956, p. 256-275.

Study on firing Martin furnaces with Mazut. Evaluation of this fuel on the basis of quantity of steel produced. (D2; RM-j)

74-D. Alloy Steels: Practice at the Clyde Alloy Steel Co., Ltd. *Iron and Coal Trades Review,* v. 174, Jan. 18, 1957, p. 139-144.

History, description and present processes of the company. Research on ingot mold design; conservation practice for metals in short supply. (D general, A11; AY)

75-D. (French.) **Study on Pilot Models of the Aerodynamics of the Martin Furnace.** F. Husson, R. Durand and G. Cohen de Lara. *Institut de Recherches de la Siderurgie (IRSID)*

Publications, Series A, No. 127, Dec. 1956, p. 204-227.

Current research into the function and operation of Martin furnaces; notes also the major problems remaining to be solved. (D2, W18)

76-D. (German.) **Special Metallurgical Problems of the Iron Industry in Bosnia.** K. Kapetanovic. *Radex-Rundschau,* no. 8, 1956, p. 367-376.

A historic survey, problems of manganese, methods of steel production, the Talbot process and its adaptation to present working conditions. 2 ref. (D general, A11a; ST)

77-D. (German.) **Slag Deposits and Flue Dust in the Subhearths of Openhearth Furnaces.** E. Neumann and J. Seitz. *Radex-Rundschau,* no. 8, 1956, p. 377-383.

Determination of quantities of slag deposits and flue dusts in furnaces with varied linings and firings, characteristic scale formation, and chemical analysis at different locations. (D2d; RM-q)

78-D. (German.) **Quality of Oxygen Steels (Sk or LD).** H. von Laizner. *Radex-Rundschau,* no. 8, 1956, p. 384-397.

Development of quality control schedules at the steel plant at Donawitz and application of new processes. (D10, S12)

79-D. Experimental Electric Smelting of Ores and Related Materials at the Department of Mines and Technical Surveys, Ottawa. G. E. Viens, R. A. Campbell and R. R. Rogers. *Canadian Mining and Metallurgical Bulletin,* v. 50, Feb. 1957, p. 70-77.

A three-phase, continuously-operated 250 kva. electric smelting furnace was installed at the Mines Branch for determining suitable smelting technique and costs of power and electrodes. Results of experiments show the value of electric smelting of iron, manganese-iron, titanium-iron, nickel and chromium-iron ores. (D8n, 1-2; Fe, Mn, Ti, Cr)

80-D. The "KALDO" Steelmaking Process in Operation. D. J. O. Brandt. *Iron and Coal Trades Review,* v. 174, Feb. 8, 1957, p. 325-327.

The new revolving kiln type of oxygen-conversion process which came into operation at Domnarfvet Steelworks, Sweden. Control of reactions and future development of the process. (D10; ST)

81-D. Use and Misuse of Ingot Moulds; Effect of Design on Corner Segregation. *Iron and Coal Trades Review,* v. 174, Feb. 8, 1957, p. 338-340.

Factors in the design of ingot molds, including some special designs, materials and the composition of metal to be cast, the use of the mold in the casting pit and some types of failure. (D9k, 1-2, 17-1)

82-D. Maintaining the Open Hearth. *Steel,* v. 140, March 4, 1957, p. 102-112.

Information on maintenance, inspection and repair of breakouts, bottom damage, the tap and flush holes, roof and other superstructures of openhearth furnaces. (D2, W18, 18-21)

83-D. (German.) **Continuously Cast Products for the Rolling Mill and the Forge.** Joseph Hofmaier. *Stahl und Eisen,* v. 77, Jan. 24, 1957, p. 69-78.

A description of continuous casting plants and their efficiency. Nature of the continuously cast billet and deformation work required in processing. Continuously cast slabs for the sheet rolling mill. Billets for the swage forge and for production of steel bars. 7 ref. (D9q; ST, 4-2)

84-D. (Book.) **A New Look at the Nature of the Open-Hearth Process.** B. M. Larsen. 1957. American Institute of Mining, Metallurgical and Petroleum Engineers, 29 W. 39th St., New York 13, N.Y. $3.00.

Unified analysis of the openhearth process in relation to the factors that control speed and fuel efficiency. Rate of heat flow in the bath, rate of carbon oxidation, and net heat requirement from fuel in relation to the amount of "air oxidation" from preheated or leakage air are treated quantitatively. Mechanism of downward heat flow and of carbon oxidation in the bath indicates the probable effect of excess oxygen, available immediately above the bath surface, on increased absorption of oxygen from the gas phase. (D2)

85-D. (Book—English.) **Production Cost of Plain Carbon Steel.** (Reprint from *Metallurgia Italiana,* v. 48, May 1956.) Petronio Allarme et al. 110 p. 1956. Associazione Italiana de Metallurgia, Via Moscova 16, Milano, Italy.

Technical and economic study of production costs and comparison between the openhearth and electric furnace processes. (D2, D5, 17-3; CN)

86-D. New Development in Ore Reduction and Steelmaking. H. B. Emerick. *Blast Furnace and Steel Plant,* v. 45, Mar. 1957, p. 313-318, and 344.

Developments of equipment and processes in U.S. and abroad, including direct fluidized solids reduction of iron ore, vacuum melting and casting, ore beneficiation, desulphurization of hot metals, basic oxygen furnace processes, rotor furnace processes, elimination of ingot defects, multiple-strand continuous casting. 14 ref.
(D general, B general; Fe, St)

87-D. Russian Research on Continuous Casting of Steel. Isotopes Used to Determine Depth of the Liquid Phase in the Ingot. R. Sewell. *Iron and Coal Trades Review,* v. 174, Feb. 15, 1957, p. 391-394.

Relationship between the depth and extent of liquid phase in the continuously cast ingot. (Based on article by V. S. Rutess in *Stal',* Jan. 1956.) (D9q; ST, 14-13)

88-D. Waste-Gas Cooling and Fume Removal in the L-D Process. R. Kemmetmuller and A. Poppy. *Iron and Coal Trades Review,* v. 174, Feb. 22, 1957, p. 499-451.

One of the most serious difficulties in the L-D process (vertical oxygen injection in a stationary converter) is the removal of the large volumes of brown iron oxide fume from the waste gases; the latest developments in cooling the waste gases and extracting the fume are described. (D10a, A8a)

89-D. Combustion and Heat Transfer in an Open-Hearth Furnace. S. W. Pearson, M. W. Thring and J. H. Chesters. *Iron and Steel Institute, Special Report* no. 59, 1956, 82 p.

Data from trials on a Templeborough furnace covering the course of mixing, the roof temperature distribution, flame emissivity and temperature, metal temperature, and the furnace heat balance. Comparison between flow pattern and mixing in model and furnace; estimate of the extent of recirculation. (D2h)

90-D. The Need for Less Sulphur in Deoxidized Steel. H. W. McQuaid and Norman P. Goss. *Metal Progress,* v. 71, Mar. 1957, p. 65-71.

Since more than 0.020% sulphur in aluminum-killed, fine-grained steel produces undesirable ferrite in supposedly all-martensitic microstructures, the authors recommend that American quality steel manufacturers install special equipment for rapid desulphurization as is already being done in several European steelworks.
(D11n, ST, *S, Al,* AD-p35, 9-19)

91-D. Electric Furnace Steel Conference. E. C. Wright. *Metal Progress,* v. 71, Mar. 1957, p. 93-96.

Economics of the electric steel industry loomed large in the discussion, what with the excessively high cost of steel scrap. Other raw materials for the nonintegrated producer which were considered are sponge iron, hydrogen reduced iron, and desiliconized pig iron from cupolas. (D5, D9; ST, Fe, RM)

92-D. Making Quality Leaded Steels. *Steel,* v. 140, Mar. 11, 1957, p. 162-166.

Careful control of rate and timing of feeding lead into molten steel, content analysis by X-ray, spectrograph, improves quality of leaded steels. (D9r, S11c; ST, *Pb*)

93-D. (German.) **Principles and Results of the Production of Steel in the Rotor Furnace.** Rudolf Graef. *Stahl und Eisen,* v. 77, Jan. 10, 1957, p. 1-10.

Two steel producing methods in Europe; adaptation to changing economical conditions, e.g., ore supplies. Use of oxygen to obtain superior steel quality, free choice in the composition of the pig iron, high batch weights, prevention of smoke hazards. (D10; ST)

94-D. (German.) **Study of Physical and Chemical Processes Occurring During the Casting and Solidification of Steel.** Hans Kosmeider, Herbert Neuhaus, Hans-Joachim Kirschning and Werner Münstermann. *Stahl und Eisen,* v. 77, Feb. 7, 1957, p. 133-143.

Thermo-electrical measurements of the temperatures of the steel on its way from the furnace to its rise in the molds as ingots of 1.4 to 4.8 tons. Behavior of rimming steels during the boiling period. Degree of purity in regard to nonmetallic inclusions. Duration of the boiling period and segregation with different shapes of ingots. Behavior of the gases in rimming steel during its subsequent treatment: Radiological examination of the mechanism of solidification of killed steels.
(D9k; ST, 9-19)

95-D. (Italian.) **Influence and Evolution of Gases in Steelmaking Processes.** J. Massinon. *Metallurgia Italiana,* v. 49, Jan. 1957, p. 24-34.

Hydrogen and nitrogen only studied. (D11; ST, *H, N*)

96-D. The Climate of the Open-Hearth Furnace. J. H. Chesters. *Iron and Steel,* v. 30, Mar. 1957, p. 87-93.

Data on conditions in openhearth. Temperature measurements, levels. fluctuations and distribution, wind velocity and direction, variation in iron oxde fumes and depostion. (To be continued.) (D2h, 1-2)

97-D. Ironmaking in Japan. Kamekichi Wada. *Iron and Steel Engineer,* v. 34, Mar. 1957, p. 107-109.

Progress in equipment, technology and production since 1948. (D general; Fe)

98-D. The Steel Industry and International Flame Research. M. Riviere. *Journal of Metals,* v. 9, Feb. 1957, p. 252-253.

Research on openhearth furnaces including heat transfer, rate of combustion and measurements to determine precise working of furnaces. 2 ref. (D2, D11)

99-D. Comparison of Blast Furnace Penetration With Model Studies. J. B. Wagstaff and W. H. Holman. *Journal of Metals,* V. 9; *AIME Transactions,* v. 209, Mar. 1957, p. 370-376.

Agreement on raceway size found between model work and measurements taken by rodding through tuyere of blast furnace. Data from blast furnaces were examined critically and variances between figures at different tuyeres and between furnaces were analyzed. Effect of operating variables on raceway diameter noted. (D1b, W17, 17-6)

100-D. Some Notes on Iron and Steel Production in Sweden. J. Dunning. *Metallurgia,* v. 55, Mar. 1957, p. 131-132.

Developments in equipment and processing of ore and in steel production. (D general, B general; Fe, ST)

101-D. (German.) **Construction and Operation of Modern 70-Ton Electric Arc Furnaces for Steel Melting.** Edmund Pakulla. *Stahl und Eisen,* v. 77, Feb. 21, 1957, p. 197-204.

Necessity for enlarging the crude steel basis; reasons for the selection of large capacity electric arc furnaces; description of an electric steel plant with two 70-ton electric arc furnaces, scrap yard, working, furnace and casting bays; characteristic data, design, operational results; comparison of the melting capacity with that of foreign electric arc furnaces; comparison of the output per hour of openhearth and electric arc furnaces. 8 ref. (D5, W18)

102-D. (German.) **Importance of Scrap in the Production of Pig Iron and Steel.** Kurt Martin. *Stahl und Eisen,* v. 77, Mar. 7, 1957, p. 259-264.

The raw material "scrap"; correlations between pig iron and scrap charged for the production of steel ingots; scrap produced, marketed and re-used; the situation of scrap supply after the end of war. (D general, A11a; ST, RM-p)

103-D. (Book—French.) **Reduction of Iron Ores.** R. Durrer. 152 p., 1957. Dunod, 92 Rue Bonaparte, Paris 6, France.

Analyzes various methods of reduction of iron ores and argues that the direct method is an economical alternative to the blast furnace. (D1, D8j; Fe, RM-n)

104-D. History of the Tropenas Process. *Australasian Manufacturer,* v. 41, Feb. 23, 1957, p. 76-101.

The Tropenas process in use today in many steel foundries is an improvement upon the bessemer process of steel manufacture. One of the drawbacks of the bessemer process was heavy air pressure required to force the blast right through the body of the bath from bottom to surface, and the difficulty of keeping the metal hot enough during the process of casting. In the Tropenas method the tuyeres for the introduction of air blast set up a rotary motion to the bath and bring about a more rapid and complete purification and conversion of iron into steel. (D3f; ST)

105-D. Russian Blast Furnace Practice. *Foundry Trade Journal,* v. 102, Feb. 21, 1957, p. 247-248.

Use in the U.S.S.R. of wet blast at constant humidity and application of high top pressure; top pressure increases blast furnace productivity. High top pressure minimizes gas cleaning problems. (D1h)

106-D. Rotor Steelmaking Process; Control, Heat Balance, and Economics. R. Graef. *Iron and Coal Trades Review,* v. 174, Feb. 22, 1957, p. 437-460.

The rotor process of steelmaking is a conversion technique in which blast furnace metal is charged to a long cylindrical kiln, which revolves slowly on its own axis, and is converted to steel by the action of nearly pure gaseous oxygen. A particular feature of the process is the system of control based on the carbon

monoxide content of waste gases. (D10; ST)

107-D. Combustion and Heat Transfer in an Open-Hearth Furnace. J. H. Chesters. *Iron and Coal Trades Review,* v. 174, Mar. 8, 1957, p. 553-562.

Initial objective was a comparison of calculated and actual heat transfer, but the trials soon took on a broader aspect and were followed by a number of more specialized studies, e.g., on the effect of burner position on iron oxide deposition. (D2h)

108-D. Sponge Iron in Electric Arc Furnaces. John L. Stalhed. *Journal of Metals,* v. 9, Feb. 1957, p. 246-249.

About 22% of Sweden's steel production is high-grade steels which are today made in electric furnaces; Sweden utilizes a greater tonnage of sponge iron than any other country; so far, it is used only for high-grade steel. Technique and advantages of sponge iron and justification for its use, although costlier than scrap. 7 ref. (D5; Fe, 6-24)

109-D. Reduction of Iron Ores. Possibilities of an Alternative to the Blast Furnace. S. G. Cope. *Murex Review,* v. 1, no. 17, 1957, p. 465-497.

Comprehensive review of attempts to find workable alternative to blast furnace; covers limitations of blast furnace and possibilities of electric smelting, low shaft and rotary furnaces for producing pig iron; direct reduction processes employing solid reducing agents including retort, shaft and rotary furnace processes and direct reduction processes involving reduction by gases including shaft, rotary kiln, multiple-hearth, bubble-hearth and other processes. 42 ref. (D1, D8; Fe)

110-D. (French.) **Use of the Electric Furnace in the Reduction of Iron Ores.** *Journal du Four Eléctrique,* no. 6, Nov-Dec. 1956, p. 217-219.

Increasingly high cost of coke is concentrating attention on the electrothermic reduction of iron ore; comparison of costs of production using the classic blast furnace and the electric furnace; general discussion of both processes. (D8n, D1, 17-3; Fe, RM-n)

111-D. (German.) **Steel Production According to the LD Method.** J. Eibl. *Osterreichische Zeitschrift für Elektrizitatswirtschaft,* v. 9, Dec. 1956, p. 551-555.

Description of the LD process—production of steel through oxygen top blowing in a converter-shaped crucible. (D10a, ST)

112-D. (Russian.) **On the Application of Radioactive Isotopes in Metallurgy.** E. Belyakova. *Atomnaya Energiya,* no. 5, Sept-Oct. 1956, p. 151-152.

Kinetics of dephosphorization and desulphurization by slags; distribution of alloying elements in open-hearth furnaces of various capacities; penetration of hot-top material into the body of an ingot; sources of contamination of ball bearing steel; liquation phenomena in steel ingots; diffusion along the grain boundary. (D11, N1; ST, 14-13)

113-D. Optimize Combustion Control on Open-Hearth Furnaces. F. S. Swaney. *Control Engineering,* Apr. 1957, p. 123-125.

Ordinary fuel-air ratio control systems can be improved by controlling combustion air according to the percentage of unburned oxygen among the waste gases. Here is a system that uses this measurement to regulate the fuel-air controller. (D2h)

114-D. Further Considerations on High-Alumina Blast Furnace Slags. H. Schrader and P. Mehra. *Indian Institute of Metals, Transactions,* v. 8, 1954-55, p. 61-79.

The problems in blast-furnace operation due to the beneficiation of raw materials and the resulting increase in alumina content of blast-furnace slag are discussed. Fluidity measurements on high-alumina slag in both the acid and basic range of lime-silica ratio were carried out. The effect of titania additions of the fluidity of high-alumina blast-furnace slags was also studied. The influence of lime, alumina, silica and magnesia additions singly and in the combined state in blast-furnace slag were studied from the viewpoint of microstructure. 19 ref. (D1g; RM-q, *Al*)

115-D. Recovery of Manganese From Steelmaking and Blast-Furnace Ferromanganese Slags. N. J. Wadia, S. Visvanathan and V. G. Paranjpe. *Indian Institute of Metals, Transactions,* v. 8, 1954-55, p. 81-108.

Since ferromanganese slags produced in the blast furnace and low-shaft furnace contain appreciable amounts of manganese, methods of recovering this valuable metal from the slags by reduction were studied. Reducing agents like ferrosilicon,

aluminum and aluminum-silicon alloys were used and products like ferromanganese, silicomanganese and 'Simanal' were obtained. 15 ref. (D1g; RM-q, AD-a, Fe, Mn)

116-D. Desulphurization of Steel by Soda Ash Treatment. N. J. Wadia, V. G. Paranjpe and S. Visvanathan. *Indian Institute of Metals, Transactions,* v. 8, 1954-55, p. 109-116.

Soda ash was used as a desulphurizing agent for liquid steel. Melts of low-carbon steel, with varying degrees of deoxidation, and of high-silicon steel were employed in this work. The results have been reviewed along with earlier work on soda slags and it has been shown that the oxygen potential under conditions of treatment influences the extent of desulphurization. 11 ref. (D11f; ST, AD-a)

117-D. Studies on the Oxidation of Phosphorus in Indian Pig Iron With Enriched Air. G. P. Chatterjee. *Indian Institute of Metals, Transactions,* v. 8, 1954-55, p. 117-127.

An attempt is made to show that the phosphorus content can be effectively reduced by top-blowing with enriched air blast. Some of the fundamental thermodynamic considerations on dephosphorization and the importance of the rate of rise of temperature under a given slag condition. Whether or not such a process can be made industrially successful depends on other factors. (D3f, D11n; ST)

118-D. "Rotor" Process of Steelmaking. Rudolph Graef. *Iron and Coal Trades Review,* v. 174, Jan. 25, 1957, p. 213-216. Extract from *Stahl und Eisen,* v. 77, Jan. 10, 1957, p. 1-10.

Previously abstracted from original. See item 93-D, 1957. (D10; ST)

119-D. Continuous Casting Comes to Carbon Steel. *Steel,* v. 140, Mar. 25, 1957, p. 108-114.

Possible development of volume production; list of continuous casting machines for steel in U.S. and abroad with information on date operation started; amount produced and types of steel cast. (D9q; CN)

120-D. (German.) **On the Hydrogen Content of Steel.** L. M. Jefimow. *Neue Hütte,* v. 2, Jan. 1957, p. 13-17.

Attempts to reduce the hydrogen content of steel; method for determination of hydrogen content; influence of blast moisture on the hydrogen content. Addition of oxygen to the combustion air of openhearth furnaces and its effect on hydrogen content and susceptibility to flaking of rail steel. 8 ref. (D11h; ST, H, 9-20)

121-D. Steel Production Today. R. L. Knight. *Australian Institute of Metals, Journal,* v. 1, Oct. 1956, p. 76-88.

Brief survey of various commercial steelmaking processes with emphasis on recent advances in design, technique and operation including oxygen converter process, openhearth, electric arc, bessemer and Thomas processes and continuous casting. (D general)

122-D. Improvements in the Quality of Silica Roof-Bricks—Pt. 9. W. M. Fern. *British Ceramic Society, Transactions,* v. 56, Mar. 1957, p. 110-132.

Trends in chemical and physical properties of silica roof blocks. Changing from high to low-alumina silica openhearth roof blocks resulted in roof lives increasing by about 100% despite higher steel production rates. However, the advantages of improved refractories can only be realized under severe operating conditions. (D2; RM-h36)

123-D. Oxygen for Steelmaking. *Industrial Chemist,* v. 32, Oct. 1956, p. 424-425.

The use of oxygen in a number of steelmaking operations can increase output by 15 to 25%. This increase can be obtained at about 1/10 the capital cost of additional steelmaking equipment. (D general; ST, O)

124-D. Fuel and Energy Requirements of the Steel Industry. W. H. Brook. *Institute of Fuel, Journal,* v. 29, Nov. 1956, p. 465-471.

The reduction of ore to steel is considered as taking place in three principal stages: (1) reduction of ore to pig iron in the blast furnace, (2) conversion of pig iron to steel ingots in the openhearth furnace, and (3) mechanical deformation of steel ingots in rolling mills to produce bars, plates, sheets, strip and other marketable products. (D general, 16)

125-D. New Process Puts Higher Profit in Low Grade Ores. *Iron Age,* v. 179, Apr. 4, 1957, p. 102-103.

Udy process employing selective reductions in electric furnace stages promises economic recovery of ferromanganese and iron from low-grade manganese ores. (D5; Fe, Mn, AD-n)

126-D. Future of the Steel Industry. *New Scientist,* Mar. 8, 1957, p. 9-11.

Plans to meet rapidly increasing demands from industry by installing new plant and improving old. Most significant is the use of cheap oxygen in steel furnaces.
(D general, W10; O)

127-D. Russian Development in Steel Casting. Tom Margerison. *New Scientist,* Mar. 28, 1957, p. 29-31.

Continuous casting in Russian steel industry. (D9q; ST)

128-D. Investigation of the Desulphurization of Pig Iron With Sodium Carbonate. O. V. Travin and L. A. Shvartsman. *Henry Brutcher Translation* no. 3865, 9 p. (From *Izvestiya Akademii Nauk SSSR,* no. 12, Dec. 1953, p. 1804-1812.) Henry Brutcher, Altadena, Calif.

Laboratory study of desulphurization of carbon-saturated iron with sodium carbonate; based on use of radioactive isotope of sulphur to establish the mechanism and the regularities of the process and to find the most efficient method of employing sodium carbonate.
(D11s; Fe, AD-a)

129-D. Use of Radioactive Calcium for Studying the Contamination of Steel by Refractory Particles During Pouring. O. M. Margulis and A. G. Karaulov. *Henry Brutcher Translation* no. 3849, 6 p. (From *Ogneupory,* v. 21, no. 6, 1956, p. 253-258.) Henry Brutcher, Altadena, Calif.

Proportions of material derived from the refractories in the ladle linings, spout linings and bottom-pouring assemblies among the total nonmetallic inclusion content of steel determined by radiometric measurements with Ca^{45}.
(D9p; ST, RM-h, Ca, 14-13)

130-D. Experiments on Increasing the Capacity of Continuous Casting Molds for Steel. K. G. Speith and A. Bungeroth. *Henry Brutcher Translation* no. 3871, 15 p. (From *Forschungsberichte,* no. 234, 1956, p. 1-15.) Henry Brutcher, Altadena, Calif.

Study of possibilities of increasing the mold productivity (capacity) in continuous casting machines for individual molds. Effect of different mold tapers (0.5, 1 and 2%) upon maximum permissible casting speed.
(D9q, 1-2; ST)

131-D. Melting of High-Purity Iron by the Carbon Reduction Process and Notch Toughness Versus Temperature Curves of This Iron. W. A. Fischer. H. Treppschuh and K. H. Köthemann. *Henry Brutcher Translation* no. 3877, 6 p. (From *Archiv Eisenhüttenwesen,* v. 27, no. 9, 1956, p. 567-572.) Henry Brutcher, Altadena, Calif.

Previously abstracted from original. See item 372-D, 1956.
(D general, Q6, Fe)

132-D. A Special Type of Ingot Crack Resulting From Certain Impurities in Steel. P. Björnson and H. Nathorst. *Henry Brutcher Translation* no. 3880, 17 p. (From *Jernkontorets Annaler,* v. 139, 1955, p. 422-438.) Henry Brutcher, Altadena, Calif.

Study of longitudinal cracks in 0.30, 0.70, and 0.80% C basic arc furnace steel ingots caused by residual copper and tin.
(D11s; ST, 9-22, 5-9, Cu, *Sn*)

133-D. Vacuum Melting of Steels and Other Iron-Base Alloys. H. Zakowa. *Henry Brutcher Translation* no. 3890, 8 p. (From *Prace IMH,* v. v. 76, no. 26, 1956, p. 1721.) Henry Brutcher, Altadena, Calif.

Previously abstracted from original. See item 402-D, 1956. (D8, ST)

134-D. Oxidation of Manganese Dissolved in Liquid Iron. B. V. Linchevskii and A. M. Samarin. *Henry Brutcher Translation* no. 3893, 3 p. (From *Doklady Akademii Nauk SSSR,* v. 110, no. 2, 1956, p. 209-211.) Henry Brutcher, Altadena, Calif.

Need for data on the formation and composition of products from oxidation reactions of manganese in solution in liquid iron, for improved techniques of deoxidizing steel with manganese. Confirmation of results by study of nonmetallic inclusions.
(D11r; Fe, Mn, AD-r)

135-D. Reduced-Pressure Treatment of Molten Steel on Plant Scale. F. Harders, H. Knüppell and K. Brotzmann. *Henry Brutcher Translation* no. 3900, 8 p. (From *Stahl und Eisen,* v. 76, no. 26, 1956, p. 1721-1728.) Henry Brutcher, Altadena, Calif.

Previously abstracted from original. See item 60-D, 1957. (D8m; ST)

136-D. (English.) **Rapid Metallurgy (Ugine-Perrin Process).** *Aciers Fins & Speciaux,* no. 25, Mar. 1957, p. 51-54.

Advantages of the process are rapidity, consistency in results and the promotion of high-speed completed reactions between metal and slag. Applications to steelmaking—

deoxidation and desulphurization of steel, over-oxidized converter steels. Process has also been applied in the refining of very low-carbon ferrochrome and over-refined ferromanganese. Costs.
(D5; ST, AD-n, Cr, Mn)

137-D. (English.) **Eastern High-Grade Steels Company at Hagondange, Moselle.** *Aciers Fins & Speciaux,* no. 25, Mar. 1957, p. 107-110.

Activities of the Societe des Aciers Fins de l'Est. Operations fall under two distinct headings: steelwork and forging shop for high-grade and special electric steels; and plate works for sheets and medium and heavy plates of all kinds. Equipment employed and range of products.
(D general, F22, F23; ST, AY)

138-D. (French.) **Recent Progress in Iron Ore Reduction Processes.** Paul Thierry. *Metallurgie et la Construction Mecanique,* v. 89, Mar. 1957, p. 207-217.

Improved efficiency of blast furnaces; increased production per unit; improved quality of pig iron; enumeration and description of processes which do not use furnace coke.
(D1h, D8; Fe)

139-D. (German.) **Chemical Equilibria in the Thomas Converter.** Alfred Decker. *Archiv für das Eisenhüttenwesen,* v. 28, Feb. 1957, p. 57-64.

Development of a procedure for the fairly exact calculation of the manganese, oxygen, phosphorus and sulphur content of the Thomas melt at the end of the smelting. 12 ref.
(D3, D11s; ST)

140-D. (German.) **Operational Results in Basic Converter Steel Plant Using Limestone in Small Lumps. Pt. 2.** Alfred Latour and Leo Heinen. *Stahl und Eisen,* v. 77, Apr. 4, 1957, p. 426-428.

Results of operation of 60 basic converter heats using small lump lime from the Volklingen-type cross-flow shaft kiln. (D3, 1-15; ST, NM-e)

141-D. (German.) **High-Vacuum Methods in Metallurgy.** Werner Scheibe. *Zeitschrift für Metallkunde,* v. 48, Mar. 1957, p. 91-100.

Melting, sintering and annealing in high vacuum; influence of oxygen, nitrogen, hydrogen and carbon on the strength properties of unalloyed and alloyed steels; magnetic properties of iron alloys. 17 ref. (D8m, H15, J23, I-23; Q27a, P16; ST, Fe)

142-D. (Portuguese.) **Selection of Carbon Steel Ingots. Pt. I.** Waldemar de Lima e Silva. *Engenharia, Mineracao e Metalurgia,* v. 25, Jan. 1957, p. 31-32.

Types of furnaces used; AISI and SAE classification; effects of carbon, manganese, phosphorus, sulphur and silicon. (To be continued.)
(D9, 1-2, 1-10; ST)

143-D. (Russian.) **Investigation of Heat Exchange and Reduction Processes During Work on a Fluxing Agglomerate.** N. N. Babarykin and F. A. Ushin. *Stal',* v. 17, Jan. 1957, p. 7-15.

During the transition of hot fluxing agglomerates, the temperature of the charge and of gas in the upper part of the blast furnace rises. Maximum speed of reduction occurs in the upper and lower parts of the charge column. 3 ref.
(D1, D11n; Fe)

144-D. Vacuum Remelting of Superalloys and Steels by the Consumable Electrode Process. W. W. Dyrkacz, R. S. DeFries and R. K. Pitler. Paper from "Arcs in Inert Atmospheres and Vacuum", Electrochemical Society. (John Wiley & Sons, Inc.), p. 97-117.

Electrodes used are air-melted, alloyed cast ingots. Data cover several superalloys, low-alloy, tool and stainless steels. Comparison is made between air-melted and vacuum remelted materials in mechanical properties, gas contents, and cleanliness as determined by inclusion ratings and forged upset tests. 6 ref. (D8m, T1f, 17-7; AY, SS, TS)

145-D. Deoxidation of Steel by Vacuum Treatment. *Iron and Coal Trades Review,* v. 174, Mar. 15, 1957, p. 617-619.

Method by which portions of metal are drawn up from the ladle into an evacuated, brick-lined chamber. (D9s, 1-23; ST)

146-D. Use of Oxygen for Pretreatment of Molten Iron: Small-Scale Experiments Under Acid and Basic Conditions. J. A. Charles and T. C. Churcher. *Iron and Coal Trades Review,* v. 174, Mar. 22, 1957, p. 667-672.

The pretreatment of molten blast-furnace metal for the removal of silicon by means of the oxygen lance or oxygen jet. The effect of some of the chief variables on the efficiency of the desiliconizing operations and the removal of phosphorus are also considered. (D1h, D11h; Fe)

147-D. (Czech.) **What the Theory of Solidification and Crystallization Can Contribute to the Development of Continuous Casting.** Nikolaj Chvorinov. *Hutnické Listy,* v. 12, Mar. 1957, p. 196-201.

Theory of continuous steel casting. On the basis of an analysis of solidification, it would be necessary to determine the cooling zones from the standpoint of conformity with solidification periods. The matter of die cooling consists primarily, according to a theoretical derivation, of the problem of cooling the die itself to obtain absolute homogeneity of temperature and to eliminate heat deformation. This is a basic requirement in respect to surface quality of cast steel as well as die wear. 9 ref. (D9q; ST)

148-D. (Czech.) **Effect of Manganese on the Oxidation of Metal and the Velocity of the Desulphurization Process in a Basic Openhearth Furnace.** Vilém Friedrich. *Hutnické Listy,* v. 12, Apr. 1957, p. 324-329.

The effect of high manganese concentration during melting and refining in a basic openhearth furnace upon the metal oxidation in the bath; the velocity of diffusion desulphurization reactions and the formation of inclusions. The increase of manganese content in the bath is of extraordinary importance especially for the attainment of a high notch toughness after aging advantageous for plastic and dynamic properties.
(D11h, D2c; AD-s, ST, *Mn*)

149-D. (Pamphlet.) **Chemistry in the Metallurgy of Iron and Steel.** John Chipman. 95 p. 1957. Pennsylvania State University, University Park, Pa. $2.50.

Lectures on physical chemistry of steelmaking; oxidation and reduction in liquid steel, Henry's law in metals, metallurgical slags, hydrogen in steelmaking, and oxygen in the steel industry. (D11)

150-D. Importance of Gas—Solid Contact in the Production of Pig Iron. T. L. Joseph. *Blast Furnace and Steel Plant,* v. 45, Apr. 1957, p. 379-384.

Reviews raw materials, gases and basic features of smelting process in blast furnace. Arrangement of materials, particle size, resistance to gas flow, gas velocity across various planes, variations in temperature, shaft temperature and iron analysis. (To be continued.)
(D1; Fe)

151-D. Review of Iron and Steel Literature for 1956. V. S. Polansky. *Blast Furnace and Steel Plant,* v. 45, Apr. 1957, p. 400-403, 407, 408, 421, 424, 425.

Lists books and pamphlets of interest to iron and steel industry published during 1956.
(D general; Fe, ST)

152-D. Design and Operation of a Blast Furnace With a Carbon Bosh Lining. E. K. Miller, Jr. *Iron and Steel Engineer,* v. 34, Apr. 1957, p. 91-94.

Experience at Gary Steel Works with carbon-lined bosh shows smoother furnace operation, less cooler trouble, larger working volume and lower fuel rates, to offset higher initial cost.
(D1b, W17g, 1-2; Fe)

153-D. Ironmaking in the USSR. E. W. Voice and S. Klemantaski. *Journal of Metals,* v. 9, Apr. 1957, p. 592-596.

Outstanding features of blast furnace design and operations, use of high top pressure, high blast temperature, high sinter burden and blast humidification. (D1)

154-D. Melting of Stainless Steel With Oxygen Lancing (in Electric Arc Furnace). N. I. Shutkin. *Henry Brutcher Translation* No. 3759, 2 p. (From *Metallurg,* v. 1, no. 1, 1956, p. 10-11). Henry Brutcher, Altadena, Calif.

Improved technique of remelting stainless scrap with oxidation of excessive carbon in charge by oxygen lancing; description of oxygen-gasifying equipment; advantages of proposed melting practice over conventional remelting.
(D5g, 1-2; SS, RM-p)

155-D. Results of Experiments on Vacuum Casting of Steel. Pt. 1. Ingot Stage. Z. Eminger and F. Kinsky. *Henry Brutcher Translation* No. 3861, 11 p. (From *Hutnicke Listy,* v. 11, no. 6, 1956, p. 345-355). Henry Brutcher, Altadena, Calif.

Vacuum casting equipment; particulars on the simplified equipment being developed; influence of vacuum casting of a Cr-Ni-Mo steel upon the properties of ingots ranging in weight from 3 lb. to 5.2 net tons; minimum ingot weight to insure the benefits of vacuum casting.
(D9, 1-23; AY)

156-D. Use of Steam-Enriched Blast Furnace Wind. F. Houdek. *Henry Brutcher Translation* No. 3869, 3 p. (From *Hutnik,* v. 5, no. 7, 1956, p. 194-196). Henry Brutcher, Altadena, Calif.

Report on Russian and Czech blast furnaces where a blast enriched with 10-15 grains of steam per cu. ft. gave an increase of 5-10% in iron production and a simultaneous 2-4% reduction in coke consumption, because of higher blast temperatures. (D1h; Fe)

157-D. Fundamentals and Operating Data on Production of Steel in a Rotary Furnace. R. Graef. *Henry Brutcher Translation* No. 3910, 10 p. (From *Stahl und Eisen,* v. 77, no. 1, 1957, p. 1-10). Henry Brutcher, Altadena, Calif.

Previously abstracted from original. See item 93-D, 1957.
(D10; ST)

158-D. Degassing of Steel in Vacuum. H. Zakowa and R. Radzwicki. *Henry Brutcher Translation* No. 3921, 5 p. (From *Biuletyn Informacyjny,* v. 7, no. 11, 1956, p. 41-45). Henry Brutcher, Altadena, Calif.

Vacuum chamber for degassing steel in ladle; results obtained when the steel was allowed to solidify in the ladle and when the steel was held under reduced pressure for a short time and then poured into mold with access of air. Pouring of ingots into molds under vacuum; development of a hood for individual molds. (D9s, 1-23; ST)

159-D. Effect of Blowing With Carbon Monoxide Gas in Electric Furnaces Upon Steel Quality. A. V. Vishnyakov and A. M. Samarin. *Henry Brutcher Translation* No. 3926, 5 p. (From *Biuletyn Informacyjny, SSSR, OTN,* no. 3, Mar. 1954, p. 102-109). Henry Brutcher, Altadena, Calif.

Exploration of possibilities of removing hydrogen and nitrogen from liquid steel and of stepping up the desulphurizing and deoxidizing rates by blowing CO through it. Experiments on blowing CO through steel bath in a high-frequency furnace without a slag blanket, and effect of this treatment on gas content, nonmetallic inclusions, and on compactness of ingots and their columnar crystal zone. (D6g, D11r; ST)

160-D. (French.) **Study of Desulphurization in the Basic Bessemer Steel Plant.** A. Decker. *Revue Universelle des Mines,* v. 13, May 1957, p. 165-212.

Theoretical and experimental study of the desulphurization of iron before refining; thermodynamic equilibria of the constituents of steel and slag at the end of conversion; principal differences which exist between iron and openhearth steel before and after blasting; desulphurization in the Thomas converter. Concludes that the desulphurization of iron is a physical and mechanical problem rather than a chemical one. 71 ref.
(D11h, D3, 1-15; ST)

161-D. "Cyclosteel": Steel Direct From Ore. G. K. Bhat. *Iron Age,* v. 179, May 23, 1957, p. 129-130.

British process for direct reduction of fine iron ore with powdered coal; system uses mixture of powdered coal and oxygen to react with heated ore.
(D8j; ST, Fe, RM-n, RM-j42)

162-D. New Electric Arc Furnaces. 70-Ton Units at Krefeld (Germany). E. Pakulla. *Iron and Coal Trades Review,* v. 174, Apr. 26, 1957, p. 967-971.

Previously abstracted from original. See item 101-D, 1957.
(D5, W18)

163-D. Oxygen Application in the Basic-Bessemer Process. M. Michaud and M. Zehringer. *Iron and Coal Trades Review,* v. 174, Apr. 26, 1957, p. 979-984.

Advantages of oxygen enrichment; problem of supplying French steel works with oxygen. 8 ref.
(D3f, 1-15; ST)

164-D. Climate of the Open-Hearth Furnace. J. H. Chesters. *Iron and Steel,* v. 30, Apr. 1957, p. 125-129.

Climatic effects and wear of silica roof of openhearth furnace. Relationships between iron oxide concentration and gas system, flow patterns, temperature, time and the rate of roof wear. Gaps in present knowledge. (D2h, 1-2; ST, RM-h)

165-D. Method Used During Forced Interruptions in Open Hearth Operations. George A. Ferris. *Journal of Metals,* v. 9, Apr. 1957, p. 591.

Replies received from questionnaires sent to 47 plants show four major methods of shutting down openhearth furnaces. (D2)

166-D. Oxygen Conversion in the Open Hearth. *Steel,* v. 140, June 3, 1957, p. 92-94.

With oxygen and no external heat, quality carbon steel was made in openhearth at Inland Steel. Waste gases escaped through both checkers, and oxygen was poured in at the slag-metal interface by lances inserted through three doors. (D2g; CN)

167-D. Scrap in Steel Mill Operations. J. P. Orton. *Waste Trade Journal,* v. 103, May 11, 1957, p. 29-32.

Problem of steel scrap in the openhearth furnace in relation to impurities and their effect on mechanical properties of steel products. (D2; ST, RM-p)

168-D. (German.) **Deoxidation and Technological Characteristics of Killed Basic Converter Steels. Pt. 1. Deoxidation Process Together With Aspect and Composition of the Deoxidation Products.** Erwin Plöckinger and Rupert Rosegger. *Stahl und Eisen,* v. 77, May 30, 1957, p. 701-714.

Deoxidation phenomena and separation of the reaction residues in the deoxidation of steels with silicon, silicon and aluminum combined and with aluminum alone; representation of the results obtained with low and high-carbon steels by means of three-dimensional diagrams. Aspect of the isolated inclusions; contents of inclusions as dependent on the amount of aluminum added. (D11r, ST-g, 1-15)

169-D. (French.) **Manufacture of Spheroidal Quality Cast Iron From Sardinian Iron Ores in Electric Reduction Furnaces.** Giuseppi Zuliani. *Journal du Four Electrique,* no. 2, Mar-Apr. 1957, p. 59-62.

Use of Sardinian ores and charcoal in special low-temperature reduction process gives cast iron superior to any other type produced by the coke process for subsequent spheroidizing. Analysis of Sardinian ores. (D8n; CI-r)

170-D. (Swedish.) **Steel Refining With Oxygen in the Rotary Furnace by the Kaldo Process.** Bo Kalling and Folke Johansson. *Jernkontorets Annaler,* v. 141, no. 4, 1957, p. 189-205.

Method developed at Domnarfvet steel works, Sweden, of refining ordinary high-phosphorus basic bessemer pig iron into steel comparable in quality with openhearth steel; technical and economic advantages. 4 ref. (D10; ST)

171-D. Importance of Gas Solid Contact in the Production of Pig Iron. Pt. 2. T. L. Joseph. *Blast Furnace and Steel Plant,* v. 45, May 1957, p. 489-493.

Relationship of blast pressure and uniformity of particle size to channeling in furnace bed and percentage of voids. Variation of hearth temperature and coke consumption with air volume and temperature of blast. Gas-solid contact with beneficiated raw materials. (D11g, D1; CI-a)

172-D. Desulphurization of Pig Iron With Solid Lime. Bo Kalling and Sven Eketorp. *Blast Furnace and Steel Plant,* v. 45, May 1957, p. 494-497, 513.

Kalling-Domnarvet process uses powdered lime and brings it into contact with the pig iron by the use of a rotary kiln or furnace. Process metallurgy; furnace construction and operation. (D11n, D8j, 1-2; CI-a, RM-b)

173-D. "Kaldo" Rotary-Oxygen Steelmaking Process. Bo Kalling and Folke Johansson. *Foundry Trade Journal,* v. 102, May 23, 1957, p. 636-637.

Side-blown rotary oxygen converter used in Swedish plant to process high-phosphorus pig iron. (D10)

174-D. Carbon Equivalent Concept. K. G. Lewis and J. McCracken. *Iron and Steel,* v. 30, May 1957, p. 165-169.

Control of carbon content in furnace charge and time of melting in the manufacture of quality forging steels in basic openhearth; gives derivation of the carbon equivalent concept for determining oxidation requirements of elements present in scrap and hot metal, and application of concept in calculating metallurgical load. 20 ref. (To be continued.) (D11r, D2; ST)

175-D. Influence of Slag Properties on Pig Composition. A. J. Burgess and B. G. Baldwin. *Iron and Steel Institute, Journal,* v. 186, June 1957, p. 227-235.

Results obtained during blast-furnace trial at the Steel Co. of Wales to study relation between metal composition and slag properties: furnace practice; experimental techniques used; iron temperature and sampling; slag temperature and sampling; results; conclusions. 11 ref. (D11n, D1b; CI-a)

176-D. Effect of Oxygen Input Rates in the Decarburization of Chromium Steel. G. W. Healy and D. C.

Hilty. *Journal of Metals,* v. 9, *AIME Transactions,* v. 209, May 1957, p. 695-707.

Heat loss studies were combined with results of previous investigations for evaluating the heat balance during the oxidizing period of chromium steel heats in terms of rate of oxygen input in relation to bath composition, bath temperature and furnace size. Carbon content at end of oxygen blow is estimated when initial composition and operating variables are known. 12 ref. (D11r; AY, *Cr*)

177-D. Good News About All-Basic Open Hearths. *Steel,* v. 140, Apr. 15, 1957, p. 134-136.

Summarizes experiences at several steel companies with all-basic openhearths. Some advantages found were longer roof life, lower fuel consumption, increased production. (D2, 1-15, 1-2)

178-D. (French.) **International Executive Committee of International Research Committee on Low-Shaft Blast Furnaces. Brief Report on the Low-Shaft Blast Furnace at Ougrée.** *Revue Universelle des Mines,* v. 13, Feb. 1957, p. 84-90.

Description of plant and raw materials used. Results of three years of research. (D8p; Fe)

179-D. (German.) **Change in the Conception of Requirements to Be Met by Foundry Coke.** Christian Gapp. *Giesserei,* v. 44, June 6, 1957, p. 347-350.

Historical development of the requirements to be met by foundry coke, particularly as regards reactivity, degree of graphitization, sulphur and ash contents as well as other features; characteristics of the HC-coke (high-carbon coke). 20 ref. (D11j; RM-j43)

180-D. (German.) **Hot-Blast Cupola in the Openhearth Steel Plant.** Albert-Friedrich Oberhofer. *Stahl und Eisen,* v. 77, May 16, 1957, p. 643-651.

Importance of the cupola furnace for the openhearth steel plant; steel scrap and direct processed blooms as charging materials; trials with raw ore; desulphurization of the iron as dependent on the operating conditions; behavior of the iron oxides; variables affecting the recarburization. (D2, 1-2)

181-D. (Book.) **Deoxidation of Steel.** Charles H. Herty. 700 p. Apr. 26, 1957. American Institute of Mining, Metallurgical and Petroleum Engineers, Inc., 29 W. 39th St., New York, N. Y. $10.

A memorial volume reprinting nine significant papers by C. H. Herty published during the late 20's and early 30's. (D11r, A2; ST)

182-D. Oxygen Lancing of Pig Iron and Subsequent Fume Treatment With a Pease-Anthony Venturi Scrubber. P. K. Gledhill, P. J. Carnall and K. H. Sargent. *Iron and Steel Institute, Journal,* v. 186, June 1957, p. 198-211.

Report on trials arranged by Dorman Long (Steel) Ltd., Redcar Works: experimental layout and equipment; process description; analytical procedure; conclusions. Scrubber used cleaned submicron iron oxide fume to concentrations of approximately 0.1 grains per cu. ft., giving a colorless stack-gas after evaporation of water vapor. It is probable that outlet dust concentration can be still further reduced by increasing pressure drop across the Venturi from 15 to 30 in. w.g. 16 ref. (D1h, A8a; CI-a)

183-D. (German.) **Automation in the Metallurgical Industry.** Reinhold Perlick. *Neue Hütte,* v. 2, Feb-Mar. 1957, p. 92-102.

Problems of blast furnace regulation; present status and recent developments in the steel industry; technological and economic conditions necessary for automating rolling mills, difficulties encountered. Specific subjects covered are pig iron, openhearth steel, electric steel and rolling mills.
(D general, F23, 18-24)

184-D. (German.) **Openhearth Furnaces With Special Reference to the Maerz Type.** Reinhold Baake and Harry Stollberg. *Neue Hütte,* v. 2, Feb-Mar. 1957, p. 157-167.

Gas production from central German soft coal briquets; influence of the gasification method; gas connection to furnace; influence of dust; high preheating temperatures and influence of infiltrated air on preheating; furnace pressure; flow in the chambers; standards for gas pressure; stack draft; resistance inside the furnace and gas and air speeds; width and length of air shaft; kinetic energy of gas flow in the upper furnace; infiltrated air in the intake head; peculiarities and advantages of the Maerz head. 37 ref. (D2h, B17)

185-D. (German.) **Prevention of Steel Flocculation.** Wolfgang Küntscher and

Karlheinz Werner. *Neue Hütte,* v. 2, May 1957, p. 280-285.

Melting method; charging materials; degassing of molten steel; degassing in the solid state. 9 ref. (D9s; ST)

186-D. (German.) **Cooling of Industrial Furnaces With Special Reference to Openhearth Furnaces.** Rudolf Schröter. *Neue Hütte,* v. 2, May 1957, p. 285-289.

Cooling, shortest possible cooling rate for refractory linings, laws of cooling and possibilities for the acceleration of cooling, heat transfer and its regulation, observation and improvement of operations during repairs. 7 ref. (D2h, P11k; ST)

187-D. (German.) **Detonation and Shock-Wave.** Michael Hansen. *Stahl und Eisen,* v. 77, June 13, 1957, p. 805-813.

Combustion, explosion and detonation; sound velocity of gases; shock-wave without heat input; shock-wave with heat input; blasting pressure of tubes; shock-tube; pressure and temperature in the shock-wave and after its reflection; explosions combined with shock-waves; computation examples; conclusions for blast furnaces and other plants. (D11j, D1)

188-D. (Japanese.) **Study on the Behavior of Titanium Compounds in the Blast Furnace. Reproduction of the Titanium "Bear" in the Laboratory and Its Melting.** B. Eto. *Iron and Steel Institute of Japan, Journal,* v. 43, Mar. 1957, p. 211-213. (CMA)

Reproduction of titanium "bear" in the laboratory was achieved by melting the artificial slag of the system SiO_2-CaO-Al_2O_3-MgO with an addition of pure iron powder and low-grade TiO_2 at 1400° C. in a stream of pure nitrogen. The titanium "bear" was attributed to the formation of titanium nitride or titanium cyanide in the slag and the catalytic role of iron was found necessary to the formation of these compounds. Increasing the amount of titanium in the slag gave rise to an increase of silicon in the pig iron, since the pig iron containing increased amounts of titanium favored the reduction of silica in the slag.
(D11n, D1g; Fe, *Ti*, RM-q, AD-p)

189-D. (Japanese.) **Studies on the Improvement of Steel Quality by Treating With Titanium Slag. Pt. IV. Characteristics of Steel Ingots Containing Titanium.** T. Shimose, Z. Takao and W. Hirano. *Iron and Steel Institute of Japan, Journal,* v. 43, Mar. 1957, p. 357-359. (CMA)

The effect of adding titanium to 40-kg. steel ingots was studied. The composition of the steel used in the experiment was 0.28% C, 0.60% Mn, 0.30% Si, 0.037% P and 0.040% S. The addition of up to 0.15% Ti to the ingots caused a gradual decrease in sulphur segregation and also in dendritic formation, but the latter showed a tendency to increase with further titanium addition. Titanium combined with oxygen and nitrogen in the molten steel to reduce defects such as ghosts encountered in steel ingot production. Titanium also produced excellent hot working characteristics in the ingots. No appreciable change in the tensile strength of the steel was observed as a result of the titanium addition. (D9r; ST, *Ti*, RM-q, AD-p)

190-D. (Japanese.) **Electrical Conductivity of Molten Slags Containing Titanium Oxide. Pt. IV. The CaO-SiO_2-TiO_2 System.** K. Mori. *Iron and Steel Institute of Japan, Journal,* v. 43, Mar. 1957, p. 379-380. (CMA)

The behavior of TiO_2 in the molten state of the slag system CaO-SiO_2-TiO_2 was investigated by electrical conductivity measurements, using a platinum crucible and electrode. The electrical conductivity of the molten slag increased with increasing amounts of CaO when TiO_2 was kept constant. On the other hand, the same effect was observed with increasing TiO_2 when the $CaO:SiO_2$ ratio remained constant. When the concentration of TiO_2 is low the electrical conductance is of ionic nature, due to Ca^{+2}. However, it is probably of electronic nature at high TiO_2 concentration, and its semiconductive properties become pronounced.
(D11n, P15g; ST, *Ti*, RM-q, AD-p)

191-D. (Japanese.) **Basicity of Slags Containing Titanium Oxide.** K. Mori. *Iron and Steel Institute of Japan, Journal,* v. 43, Mar. 1957, p. 380-381. (CMA)

To investigate the basicity of slags containing TiO_2 the binary systems SiO_2-TiO_2 and CaO-TiO_2 of various compositions were mixed with iron oxide, equilibrated at 1480° C. under an atmosphere of CO_2 and CO (ratio $CO_2:CO = 13.3$), and analyzed for values of the ratio Fe^{+3} +

Fe^{+2}. In the binary SiO_2-TiO_2 system, TiO_2 behaves like a base when the TiO_2 concentration is low, but becomes acidic with increasing TiO_2. The system CaO-TiO_2 was found to be definitely acidic.
(D11n; ST, *Ti*, RM-q, AD-p)

192-D. (Japanese.) **Influence of Charging Size on Blast Furnace Operation.** Takashi Kosuge and Koretaka Kodama. *Iron and Steel Institute of Japan, Journal,* v. 43, Apr. 1957, p. 421-431.

Operational particle size specifications are given for magnetite and hematite. The coke ratio was 0.597 during the tests. The relation between ore size, permeability and reducibility of ore was found to be significant. (D1a; Fe, RM-n)

193-D. (Japanese.) **On the V-Segregates of Large Steel Ingots.** Masayoshi Kawai. *Iron and Steel Institute of Japan, Journal,* v. 43, Apr. 1957, p. 431-437.

The V-inclination of V-segregates has close correlations with the height to diameter ratio of ingots; relations between the flaws in V-segregates and various casting conditions are indicated. (D9; ST, 9-19)

194-D. (Polish.) **Example of Slag Ionic Theory Application to Quantitative Interpretation of Metal-Slag Reaction.** Andrzej Staronka. *Hutnik,* v. 24, Feb. 1957, p. 51-55.

Definition of slag alkalinity according to molecular and ionic theory; sulphur distribution equilibrium between the metal and the basic slag; example of equilibrium constant computation on the basis of ionic theory. 15 ref. (D11n; RM-q)

195-D. (Polish.) **Steel Desulphurization Problem in Basic Openhearth Furnace.** Tadeusz Mazanek. *Hutnik,* v. 24, Feb. 1957, p. 55-58.

Modern concepts of steel desulphurization in basic furnaces; desulphurization technology in basic openhearth furnaces; desulphurization problem in Polish steel mills and possibilities of improvement.
(D11n, D2d; ST, *S*)

196-D. **Injection of Lime Through the Blast-Furnace Tuyeres.** Paul B. Stubbs. *Blast Furnace and Steel Plant,* v. 45 June 1957, p. 599-600, 613.

Two-month test with full-scale injection equipment was made. Results indicated that this is not a promising method for controlling sulphur or improving smoothness of furnace operation. However, injection of other finely divided solids may warrant future testing.
(D1a, 1-2; NM-f44, ST)

197-D. **Use of Low-Carbon Iron From Hot-Blast Cupolas in Open-Hearth Furnaces.** *Foundry Trade Journal,* v. 102, June 13, 1957, p. 736.

West German steelworks use hot-blast cupola metal to reduce charging and refining time for openhearth furnace operation. (D2g; ST)

198-D. **New Process Makes Rolled Steel Directly From Pig Iron.** *Iron Age,* v. 179, June 27, 1957, p. 97-100.

Swedish powder process makes steel from pig iron by granulating pre-refined pig iron, boxing granules, heating, decarburizing and rolling into steel sheet; mechanical properties of processed steel. (D8q; ST)

199-D. **Gaseous Ore-Reduction Processes. Experiments on Egyptian Iron Ores.** *Iron and Coal Trades Review,* v. 174, May 17, 1957, p. 1127-1131.

Investigates the possibilities of hydrogen reduction of Egyptian iron ores. Describes some laboratory trials using hydrogen and petroleum gas. (D8j; Fe, RM-n)

200-D. **Combustion and Heat Transfer in an O. H. Furnace.** S. W. Pearson, M. W. Thring and J. H. Chesters. *Iron and Steel,* v. 30, June 1957, p. 324-326.

Summary of 80-page report of a large-scale trial to check mathematical theory of heat transfer in openhearth furnace. (D2h, P11k)

201-D. **Blast Furnace U. S. A. Pt. II. The Age of Mineral Coal.** M. O. Holowaty and C. M. Squarcy. *Journal of Metals,* v. 9, July 1957, Sec. 1, p. 957-963.

Covers 1750 to 1850; rise of Pittsburgh and the Pennsylvania iron industry; mineral coal replaced charcoal as furnaces grew larger and the blast was heated. (D1; RM-j42)

202-D. **Swedish Oxygen Steelmaking.** Folke Johannson. *Journal of Metals,* v. 9, July 1957, Sec. 1, p. 972-975.

Kal-Do process was developed to convert high-phosphorus iron into steel of openhearth quality using high-purity oxygen. Process is also economical for low-phosphorus iron.
(D10; ST)

203-D. Blast Furnace Oxygen Operations. Julius H. Strassburger. *Proceedings of the 64th General Meeting of the Iron and Steel Institute,* 1956, p. 175-207.

Operation of oxygen plant with 450 tons daily capacity at Weirton Steel Co. Oxygen used for enrichment of blast, for blast furnace iron production and other steel plant operations. Operation of air cleaners, compressors, heat exchangers, high-pressure columns, acetylene and carbon dioxide eliminators, expanders, and oxygen compressors in the oxygen plant; oxygen control and effect of oxygen enrichment on blast furnace operations. (D1h, 1-2)

204-D. Study of Desulphurization of Cupola Iron With Magnesium (in Ladle). V. I. Lakomskii. *Liteinoe Proizvodstvo,* no. 1, Jan. 1957, p. 9-11. (*Henry Brutcher Translation* no. 3946).

Kinetic study of the desulphurization of ingot iron-ferrous sulphide mixtures by technically pure magnesium. Variation of degree of desulphurization with amount of magnesium added and with temperature. Heat of desulphurization and energy of activation of desulphurization. (D9m, P12q, Fe, *S, Mg*)

205-D. Continuous Casting of Steel, Studied With Radioisotopes. B. N. Katomin and V. S. Rutes. *Izvestiya Akademii Nauk OTN,* no. 1, Jan. 1957, p. 123-135. (*Henry Brutcher Translation* no. 3944).

Study of solidification of billets (slabs) in continuous casting by use of radioactive P^{32}, S^{35}, and liquid lead, and measurements of temperature inside the billet, in an effort to establish correlations among depth of liquid phase, distribution of solidification boundary, rate of billet solidification, quantity of heat removed, speed of descent, cooling rate, and physical properties of billet. Formation of a solid shell on billet in mold; heat exchange in mold; comparison with still-cast ingots; effect of penetration of water from secondary cooling into gap between billet and mold upon mean solidification coefficient. (D9q; ST, 14-13)

206-D. Gases and Nometallic Inclusions in Continuous Cast Steel. V. I. Yavoiskii. *Proceedings of the First All-Union Conference on the Continuous Casting of Steel—Oct. 1955,* 1956, p. 199-211. (*Henry Brutcher Translation* no. 3964).

Segregation, distribution and amounts of nonmetallic inclusions and gases (hydrogen and nitrogen) in continuous cast steel compared with still-cast ingots. Macrosegregation characteristic of continuous cast rectangular and square sections; nature of light band running along the edges. Nonmetallic inclusions—overall quantity and uniformity of distribution in continuous cast as against still-cast steel. (D9q; ST, EG-m, 9-19)

207-D. (German.) **Use of Oxygen in Refining Pig Iron.** Walter Bading. *Stahl und Eisen,* v. 77, July 11, 1957, p. 926-931.

Reasons for the use of oxygen in the production of steel; use of oxygen mixed with the air in the bottom-blowing converter; safety of operation in the application of pure oxygen to the process of blowing oxygen onto the surface of the steel bath; precautionary measures in installing the pipes; incorporation of safety devices to prevent accidents. (D10, D1h, D2g, D3f; ST)

208-D. (German.) **Dephosphorization of Basic Converter Steel.** Hans Kosmider and Hermann Schenck. *Stahl und Eisen,* v. 77, July 11, 1957, p. 917-926.

Effect of a high lime addition in obtaining a very low phosphorus content; shortening of the time of afterblow and reduction of iron losses by use of small amounts of secondary slag; value of the slag produced as a fertilizer; manganese, sulphur and nitrogen reaction during dephosphorization. (D3d, D11n; ST, RM-q)

209-D. (Polish.) **Humidification of the Blast in Blast Furnaces.** Zbigniew Rychlik and Wladyslaw Sabela. *Hutnik,* v. 24, Apr. 1957, p. 147-153.

Reasons for blast humidity control; conditions and results of humid blast application; measurement of blast humidity; manual control; automatic control. 7 ref. (D1h, X7)

210-D. (Polish.) **Possibilities of Open-hearth Production Improvement by Analysis of Technical and Economical Indexes.** Pawel Kielski. *Hutnik,* v. 24, Apr. 1957, p. 153-158.

Method of recalculation of technical and economical indexes in terms of tons of steel produced; application of the results in obtaining objective estimates and correct conclusions. (D2, A4p; ST)

211-D. (Russian.) **Reason for Fast Smelting of X21H11B2,5 Steel.** V. V. Panin. *Liteinoe Proizvodstvo,* no. 1, Jan. 1957, p. 11-14.

Moscow and Ural electric smelting techniques for heat resisting steel; arguments in favor of the fast technique. (D5; SS, SGA-h)

212-D. (Book.) **Bibliography on the Continuous Casting of Steel, 1933-1957.** 21 p. 1957. Iron and Steel Institute, 4 Grosvenor Gardens, London, S.W.1. 25s, nonmembers; 15s, members.

Chronological references with abstracts; indexes to authors; processes and plants in operation. (D9q; 11-15)

213-D. Special Bar Raises Killed Steel Yield. R. G. Brown. *Iron Age,* v. 180, July 4, 1957, p. 88-89.

Suspending special aluminum bar in ingot mold eliminates difficulty in keeping aluminum under surface of molten steel long enough to do the oxidizing. (D9k; ST-c *Al*)

214-D. Tonnage Oxygen. Field of Application in Steelmaking. F. J. Clark and J. L. Harrison. *Journal of the Iron and Steel Institute,* v. 186, July 1957, p. 305-323.

Operating costs for openhearth furnaces with and without oxygen; combination of oxygen application in the openhearth and oxygen-steam-blown basic bessemer converter. Developments in tonnage plants; plants in operation or under construction. 16 ref. (D2g, D3f; ST, *O*)

215-D. Thermodynamic Study of FeO-Fe_2O_3-SiO_2, FeO-Fe_2O_3-P_2O_5, and FeO-Fe_2O_3-SiO_2-P_2O_5 Molten Systems. E. T. Türkdogan and Patricia M. Bills. *Journal of the Iron and Steel Institute,* v. 186, July 1957, p. 329-339.

Relation of Fe^{+++}/Fe^{++} ratio to silica and phosphorus pentoxide concentrations for p_{CO_2}/p_{CO} ratios from 75.0 down to very low values where melts are in equilibrium with liquid iron. 22 ref. (D11n, P12; Fe, RM-p)

216-D. Maintenance of Equilibrium in Blast Furnace Operation. Charles E. Agnew. *Steel,* v. 141, July 29, 1957, p. 120-134.

Maintenance of equilibrium between preparation for smelting and smelting as controlled by blast temperature and pressure and furnace burden in blast furnace operations. (To be continued.) (D1b, D11; ST)

217-D. Maintenance of Equilibrium in Blast Furnace Operation. Pt. 2. Charles E. Agnew. *Steel,* v. 141, Aug. 5, 1957, p. 96-104.

Discusses furnace operation in relation to maintenance of thermal and mechanical equilibria; of importance are burden weight, resistance to gas passage, gas volume, chemical composition of burden, blast temperature and heat volume. (D1b, D11; ST)

218-D. Boron in Iron and Steel. R. A. Grange. Part 1 of "Boron, Calcium, Columbium, and Zirconium in Iron and Steel", John Wiley & Sons, Inc., p. 1-57.

Historical review, fundamental aspects, addition of boron to steel, effect of boron on heat treating characteristics, engineering properties, boron in ferrous alloys other than constructional steels. Bibliography arranged by years. (D9r, Q general, 2-10; ST, B, AD-q)

219-D. Calcium in Iron and Steel. F. J. Shortsleeve and D. C. Hilty. Part 2 of "Boron, Calcium, Columbium, and Zirconium in Iron and Steel", John Wiley & Sons, Inc., p. 61-101.

Calcium metal, deoxidation and desulphurization by calcium, application of calcium in steel and in cast iron. Bibliography listing 91 items. (D11r; ST, Ca, AD-r, AD-a)

220-D. Columbium in Iron and Steel. W. O. Binder. Part 3 of "Boron, Calcium, Columbium, and Zirconium in Iron and Steel", John Wiley & Sons, Inc., p. 105-414.

Columbium minerals and metal, constitution of iron-columbium and alloys, effects of columbium on structure and mechanical properties of various steels, physical properties and corrosion resistance of austenitic stainless containing columbium, and gas-turbine alloys containing columbium and tantalum. Bibliography listing 319 items. (D9r, Q general, R general, 2-10; ST, SS, Cb, AD-q)

221-D. Zirconium in Iron and Steel. George T. Motock and C. M. Offenhauer. Part 4 of "Boron, Calcium, Columbium, and Zirconium in Iron and Steel", John Wiley & Sons, Inc., p. 417-502.

Extraction and properties, alloys of interest in steelmaking, effects of zirconium in iron and steel. Bibliography of 145 items. (D9r, Q general, 2-10, AY, Zr, AD-q)

222-D. Development and Industrial Application of Continuous Casting to Steel. M. S. Boichenko, V. S. Rutes

and N. A. Nikolaev. *Stal'*, v. 16, 1956, p. 505-513. (*Henry Brutcher Translation* no. 3818.)

Previously abstracted from original. See item 208-D, 1956. (D2, D9q; ST)

223-D. Vacuum Treatment of Steel. V. G. Speranskii. *Metallurg*, no. 8, Aug. 1956, p. 12-15. (*Henry Brutcher Translation*, no. 3973.)

Previously abstracted from original. See item 343-D, 1956. (D8m, Ay)

224-D. (Russian.) **Quality of Steel Ingots Improved by Ultrasound Treatment.** N. P. Nikolaichik and E. N. Nikolaichik. *Stal'*, v. 17, Apr. 1957, p. 322-325. (*Henry Brutcher Translation* no. 3985.)

Nature of action of ultrasonic waves on liquids and gases; preliminary experiments on the casting of paraffin wax and stearin ingots; experimental set-up for casting under ultrasound; study of effect of ultrasound upon solidification of iron-carbon alloys; effect of ultrasound on macro and microstructures of steels and cast irons, on solubility of gases in them, and on mechanical properties. (D9, 1-24; ST)

225-D. Use of Vacuum in Ferrous Metallurgy. G. A. Garnyk. *Stal'*, v. 16, no. 7, 1956, p. 661-662. (*Henry Brutcher Translation* no. 3989.)

Data on quality improvement obtained with transformer iron, chromium-nickel stainless and constructional steels, high-purity molybdenum, ductile vanadium, carbon-free ferrochromium, manganese metal and chromium metal. Vacuum treatment of steel in main ladle compared with treatment in tundish and ingot molds. (D9m, 1-23; Fe, AY, SS)

226-D. Influence of Alkaline-Earth Metal Oxides Upon Distribution of Sulphur Between Iron and Iron-Containing Slag. L. A. Shvartsman, I. A. Tomilin, O. V. Travin and I. A. Popov. *Problems of Metallography and Metal Physics*, 4th Collection of Papers, 1955, Moscow, p. 577-594. (*Henry Brutcher Translation* no. 4001.)

Study of slag conditions most conducive to sulphur removal from liquid iron, with special reference to temperature dependence of the sulphur distribution equilibrium and the ifnluence of the oxides of Mg, Ca, and Ba on this equilibrium. (D11n, 2-10; Fe, RM-q)

227-D. Influence of Sulphur Upon Interphase Tension at Metal-Slag Boundary. S. I. Popel, O. A. Esin, G. F. Konovalov and N. S. Smirnov. *Doklady Akademii Nauk SSSR*, v. 112, no. 1, 1957, p. 104-106. (*Henry Brutcher Translation* no. 4002.)

Data on equilibrium tension and dynamic tension during transfer of sulphur from metal to slag and vice versa. Change in form of metal drops (static interphase tension) with increasing sulphur (and oxygen) concentrations, and corresponding numerical values. (D11n; S, RM-q)

228-D. (Russian.) **Mold Design for Continuous Casting of Steel.** G. I. Korlitin and L. N. Kolybalov. *Stal'*, v. 17, Mar. 1957, p. 209-213. (*Henry Brutcher Translation* no. 4004.)

The use of a reciprocating mold permits elimination of sticking of the billets, increases uniformity of continuous casting and improves quality of the billet. Experience with new design has revealed the possibility of reducing weight and cost, increasing mold life and introducing automation. (D9q, W19e, 1-2; ST)

229-D. Conveyor Machine for Continuous Casting of Steel. M. F. Goldobin. *Proceedings of the First All-Union Conference on the Continuous Casting of Steel*, Oct. 1955, 1956, Moscow, p. 111-118. (*Henry Brutcher Translation* no. 4005.)

Principle of machine conceived in 1946; billet moves together with, and at the same speed as, the mold; details on design and operation of machine; improvements made to machine since 1946; output data for 1950 to 1955. (D9q, 1-2; ST)

230-D. Projected Continuous Casting Machine According to Goldolin for Medium-Output Openhearth Steel Plants. G. A. Garbuz. *Proceedings of the First All-Union Conference on the Continuous Casting of Steel*, Oct. 1955, 1956, Moscow, p. 119-122. (*Henry Brutcher Translation* no. 4006.)

Proposed near-horizontal continuous casting machine to be erected at two Russian steel plants, with technical operating data as calculated. (D9q, 1-2; ST)

231-D. Questions Relating to the Application of Radioactive Isotopes in Metallurgy. (From the Moscow Conference on Experimental Techniques and Methods of High-Temperature Research.) E. Belyakova. *Soviet*

Journal of Atomic Energy. No. 5, 1956, p. 850-851. (Translated by Consultants' Bureau, Inc.)

By means of radioactive isotopes, the following topics were investigated: kinetics of dephosphorization and desulphurization of metal by slag; movement of metal and distribution of alloying elements in openhearth furnaces; penetration of feeder head fluxes; contamination in ball bearing steel; segregation processes in steel ingot; self-diffusion of iron in the alloy with 3% Si. (D11, 1-4; 14-13)

232-D. Investigation of Forces Acting on the Various Parts of a Continuous Steel-Casting Machine. V. F. Shchukin. *Stal'*, v. 17, no. 4, 1957, p. 320-322. *(Henry Brutcher Translation* no. 4022.)

Technique of measurements of (*a*) the forces resisting the withdrawal of the billet from the mold; (*b*) the pressure exerted by withdrawing rollers on the billet; (*c*) the torque on the universal spindles; and (*d*) the current, voltage and speed of electric motors. (D9q, 1-2; ST)

233-D. How the Theory of Solidification and Crystallization Can Contribute to the Development of Continuous Casting. N. Chvorinov. *Hutnicke Listy*, v. 12, no. 3, 1957, p. 196-201. *(Henry Brutcher Translation* no. 4023.)

Previously abstracted from original. See item 147-D, 1957. (D9q, ST)

234-D. Refining of Steel With Oxygen in a Rotating Furnace by the "Kaldo" Process. B. Kalling and F. Johansson. *Jernkontorets Annaler*, v. 141, no. 4, 1957, p. 189-206. *(Henry Brutcher Translation* no. 4025.)

Report on the latest results (up to April 1957) obtained with the Kaldo steelmaking process. General features: furnace design and operation. (D10; ST)

235-D. (French.) **New Contribution to the Manufacture of Low Metalloid Content Thomas Steel.** P. Leroy, B. Trentini and E. Devernay. *Institut de Recherches de la Sidérurgie, Publications*, Ser. A, no. 124, Feb. 1957, p. 1-50. (Reprinted from *Documentation Metallurgique*, Spec. No. Sa 1, June 15, 1956, p. 12-61.)

Extensive experiments confirmed previous work on possibility of producing Thomas steel with very low nitrogen, phosphorus and sulphur content simply by using oxygen-enriched blast and appropriate oxidizing additions. New conclusions: thermal cycle of charge explains in large part fluctuations in final nitrogen content; low phosphorus content can be achieved by final thermal correction consisting of controlled additions of pulverized limestone flux for hot pours, ferrosilicon and lime for cold pours. 5 ref. (D3; ST)

236-D. (French.) **Continuous Reading of Temperature of the Melt in Controlling Smelting in the Thomas Converter.** B. Trentini, P. Leroy and M. Gombert. *Institut de Recherches de La Sidérurgie*, ser. A, no. 125, Oct. 1956, p. 1-26. (Reprinted from *Documentation Metallurgique*, Spec. No. So 1, June 1956, p. 62-87.)

Characteristics of temperature curve during final moments of dephosphorization, influence of temperature and chemical factors on nitridization of the melt studied with aid of two-color pyrometer. 20 ref. (D3d, S16, ST)

237-D. (Italian.) **The Linz-Donawitz Process: A New Method for Producing Steel.** *Fonderia*, v. 6, May 1957, p. 213-214.

Process fundamentals briefly indicated; types and properties of steels produced by LD oxygen blast process compared with those of Siemens-Martin steels; some applications of LD steels. (D10a; ST)

238-D. (Japanese.) **Desulphurization of Liquid Pig Iron With Calcium Cyanide.** Chiuyo Hisatsume and Yosisada Ueda. *Casting Institute of Japan, Journal*, v. 29, June 1957, p. 427-435.

Several kinds of liquid pig iron were treated with calcium cyanide in the amount of 0.5, 1.0, 1.5 and 2.0% to study desulphurization, carbon content and nitrogen content. Thermodynamic considerations discussed. 18 ref. (D11n; CI-a)

239-D. (Polish.) **Influence of Steel Mill Practices Upon Steel Ingot Cracking When Rolled.** Tadeusz Mazanek and Joseph Koza. *Hutnik*, v. 24, June 1957, p. 218-221.

Annual production results of one mill are discussed. Influence of melting, ingot cooling time, reheating time and ingot aging in the molds. 3 ref. (D9; ST)

240-D. (Russian.) **Study of Vanadium Slags Obtained in the Refining of Pig**

Iron. A. Yu.Polakova and A. V. Rudneva. *Akademiya Nauk S.S.S.R. Izvestiya Otdelenie Tekhnicheskikh Nauk*, v. 4, Apr. 1957, p. 44-53. (CMA)

Vanadium-containing slags coming from pig iron refining operations are important substitutes for natural vanadium ores. Previous findings that the principal vanadium-containing compound in such slags is a "spinelide", a mineral with a spinel lattice in which vanadium and iron are partially replaced by trivalent chromium, aluminum and titanium, is confirmed. Since this spinelide remains solid at very high temperatures and, furthermore, it is insoluble in the silicates of the slag, the latter is very viscous and consequently unwieldy for treatment. 4 ref. (D11n; Fe, V, RM-q)

241-D. (Russian.) **Production of Aging-Resistant Steel.** I. S. Marakhovski and A. A. Podgorodeshkii. *Metallurg*, v. 2, May 1957, p. 11-13.

Killed, low-carbon steel containing aluminum, and rimmed steel containing vanadium, are recommended for auto bodies as being very little affected by aging. Chemical composition and manufacturing process of both steels. Better finish is obtained with the steel containing vanadium. (D general, N7e; ST)

242-D. (Russian.) **Vacuum Treated Electrosteel.** G. M. Borodulin. *Metallurg*, v. 2, May 1957, p. 16-18. (*Henry Brutcher Translation* no. 3999.)

Advantages of vacuum application in production of electric steel; notes that it is possible to obtain steel containing 0.01-0.02% C and 0.004-0.005% S. Vacuum treated structural steel contains very few internal hair cracks. Hydrogen content can also be reduced. (D5g, 1-23; ST)

243-D. (Russian.) **Blast Furnace Performance With Oxygen Enriched Blast.** F. A. Khilkevitch, B. L. Lazarev and S. V. Bazilevich. *Metallurg*, v. 2, June 1957, p. 3-7.

A 2½ month run of the blast furnace with oxygen enriched blast is described. The process is not economical because of high price of oxygen and relatively low gain in cast iron output (around 6%). Application of oxygen enriched blast in production of ferromanganese is more successful since the output increases by 11.2%. (D1h; Fe)

244-D. (Russian.) **Deoxidation of Rimmed Steel in the Ladle With Ferromanganese.** D. S. Gertchikov, A. M. Ofengenden and L. M. Pokras. *Metallurg*, v. 2, June 1957, p. 13-15.

Product obtained is of uniform composition; silicon content is below 0.03%; low-carbon steels show no increase of carbon. The process is economical because the melt is 15 min. shorter and required quantity of the ferromanganese is greatly reduced. (D9m; ST, Mn, AD-n)

245-D. (Russian.) **Influence of Oxygen Content Upon Qualities of Soft, Rimmed Steel.** A. M. Potchman. *Metallurg*, v. 2, June 1957, p. 15-16.

Examination of 53 batches of soft, rimmed steel shows that the best stamping properties are obtained with oxygen content about 0.036-0.040%, and when the best aging properties are at 0.056-0.066% oxygen. (D11s; ST-d)

246-D. (Russian.) **Application of Agglomerate in Openhearth Melting.** N. A. Vetcher, A. A. Lebedev and L. D. Kornev. *Metallurg*, v. 2, June 1957, p. 17-19.

Openhearth process run for two years with total or partial replacement of the ore by the agglomerate shows that consumption of the agglomerate is 10% greater than that of the ore; amount of the slag increases with the amount of the agglomerate; time of smelting is reduced; iron oxide content in the slag increases; phosphorus content is reduced together with the required quantity of calcium and aluminum oxides. (D2, D11n; ST)

247-D. (Russian.) **Melting of Structural Steel in the Electric Furnace With Oxygen Blowing.** S. M. Gnuchev, V. P. Frantsov, G. F. Morenko, G. K. Kommissarov and Z. V. Klochkova. *Stal'*, v. 17, Mar. 1957, p. 228-232.

When melting structural steels in electric furnaces, the use of oxygen during the oxidizing period in place of iron ore does not deteriorate the metal quality and does not decrease the durability of the furnace. 9 ref. (D5g; ST, SGB-s)

248-D. (Russian.) **Iron Balance in Blast Furnace Production.** L. L. Zusman and N. F. Sklokin, *Stal'*, v. 17, Mar. 1957, p. 264-267.

Iron balance in blast furnaces indicates an improvement in the use of the raw materials and a general higher level of production knowledge. Introduction of progressive methods in the preparation of ores for smelting, technological processes and organization of production will secure a further reduction of the scrap metal. (D1b; Fe)

249-D. (Russian.) **Economic Appraisal of Steel Production Processes.** R. V. Bregman. *Stal',* v. 17, Mar. 1957, p. 268-272.

Tables comparing power and costs for converter and openhearth; it is concluded that it is expedient to place the converter right beside the openhearth furnaces, and that the converter should operate with compressed oxygen fed from above. This will guarantee a considerable improvement of the quality of the converter steel. (D3, D2, 17-3; ST)

250-D. (Russian.) **Concerning the Automation of the Horizontal Distribution of the Burden in the Blast Furnace.** P. N. Grekov and V. K. Gruzinov. *Stal',* v. 17, Apr. 1957, p. 300-304.

Application of the burden distributor with an intermediate revolving hopper, as proposed by A. S. Aiukov, facilitates controlling the horizontal distribution of materials. (D1a, 18-24; Fe)

251-D. (Russian.) **Preliminary Data on the Application of the Converter Process to Chalil Iron.** S. G. Afanasev, M. M. Shumov, Z. D. Epshtein, T. V. Andreev, M. P. Kvitko and G. V. Gurskii. *Stal',* v. 17, Apr. 1957, p. 310-317.

Tables and drawings of furnaces for duplex process (basic converter-electric furnace or basic converter-openhearth), as well as for the mono-process of a converter operating with oxygen blast to produce high-quality steel directly. (D7a, D3f; ST)

252-D. (Russian.) **Lined Metal Hot-Tops.** I. S. Tkachev. *Stal',* v. 17, Apr. 1957, p. 318-319.

The replacement of ceramic floating hot-tops by lined steel hot-tops, when pouring killed steel, produces substantial economic effect due to high durability of the new design hot-tops and reduction of metal losses. (D9p, W19e, 1-2; ST-c)

253-D. (Russian.) **Investigation of Stress Effects Upon the Assembled Installation of Continuous Casting of Steel.** V. F. Shchukin. *Stal',* p. 17, Apr. 1957, p. 320-322.

An investigation of stress effects upon assemblies of an installation for continuous casting of steel shows regular fluctuations along the billet. To decrease the most dangerous stresses, it was found expedient to employ an oscillating frame for suspension of the mold, which eliminated the lateral pressure of the billet. (D9q, 1-2; ST)

254-D. (Russian.) **An Investigation of Longitudinal Cracks on Railroad Rail Flanges.** V. A. Nikitskaya and A. M. Karpunin. *Stal',* v. 17, Apr. 1957, p. 347-351.

Elimination of longitudinal cracks by controlling speed of pouring the ingot and the fluidity of the metal, and in particular by top pouring of the ingot, which permits improvement of the macrostructure of the ingot bottom. (D9p, M28h, T23q, 9-22)

255-D. (Swedish.) **L-D Process.** Hubert Hauttmann. *Jernkontorets Annaler,* v. 141, no. 6, 1957, p. 332-349.

Description of Austrian plants; properties of the steel in comparison with that of other processes. 12 ref. (D10a; ST)

256-D. **Granite City Steel Co. a Provider of Iron and Steel Since 1878.** Charles Longenecker. *Blast Furnace and Steel Plant,* v. 45, Aug. 1957, p. 858-878.

Capacity, dimensions, layout and operation of coke oven, blast furnaces, openhearth, slabbing mill, strip mill, sheet and strip finishing facilities. (D general, F23, 1-2; ST)

257-D. **Furnace Pressure and Heat Transfer.** C. H. Stone. *British Steelmaker,* v. 23, Aug. 1957, p. 246-249.

Report of tests to determine effects of pressure on heat transfer, which entail raising pressure in openhearth furnace and working with short flames. (D2h)

258-D. **Rotary Oxygen Steel Making Developed in Sweden.** Bo Kalling and Folke Johansson. *Canadian Metalworking,* v. 20, July 1957, p. 42-45.

Stora Kal-Do rotary oxygen process uses 30-ton rotating furnace and 2300 cu. ft. of oxygen per ton of hot metal for refining high-phosphorus pig iron; process operations and advantages. (D10; ST, CI-a)

259-D. **Simulation Technique.** *Castings,* v. 3, May 1957, p. 19-20.

Note on technique using stearin wax castings to simulate conditions occurring during solidification of steel ingots. Effect on piping of gas evolution and cooling rate in wax castings. (D9; ST, 9-17)

260-D. **Use of Sinter at Dorman Long Steel, Ltd.** A. Ledgard, D. Rist and P. K. Gladhill. *Iron and Coal*

Trades Review, v. 175, Aug. 2, 1957, p. 249-258.

Performance of the blast-furnace plants of Dorman Long Steel, Ltd., improved as sinter was progressively introduced into the burden and then deteriorated notably when owing to a mishap, the production of sinter was temporarily diminished. (D1; Fe)

261-D. Air Assisted Openhearth Combustion. Some Russian Experiments. S. N. Bystrov and A. A. Dobrokhotov. *Iron and Coal Trades Review,* v. 174, May 3, 1957, p. 1028-1030. (Translation from *Stal',* v. 16, no. 7, June 1956, p. 597-601.)

Previously abstracted from original. See item 327-D, 1956. (D2, ST)

262-D. Vacuum Treatment of Steel in Russia. Experiments on Bessemer and Electric Steels. A. M. Samarin, L. M. Novik, N. I. Goncharenko and A. F. Tregubenko. *Iron and Coal Trades Review,* v. 174, May 10, 1957, p. 1075-1077. (Translation from *Stal',* v. 16, no. 8, Aug. 1956, p. 700-707.)

Previously abstracted from original. See item D-334, 1956. (D8, Q general, ST)

263-D. Russian Basic Roof Experience. R. Sewell. *Iron and Steel,* v. 30, Aug. 1957, p. 389-391.

Report of Inter-Works School for the Study of Basic Roofs on openhearth roof life, furnace productivity and operational conditions. (To be continued.) (D2, 1-2; RM-h)

264-D. Development of Controlled Air Distribution for the Blast Furnace. J. M. Stapleton. *Iron and Steel Engineer,* v. 34, July 1957, p. 137-140.

Blast distribution before tuyere redesign; functioning of automatically controlled air proportioning system; evaluation of effect of air proportioning installation on furnace performance and lining life. (D1, 1-2)

265-D. Continuous Casting at Atlas Steels Ltd. L. F. Banrhardt, G. E. Stock, and W. U. Porter. *Journal of Metals,* v. 9, Aug. 1957, p. 1050-1051.

Procedures employed in operating North America's first commercial steel casting machine at Atlas Steel Ltd., Welland, Ont. (D9q; ST)

266-D. British Steelmaking Today and Tomorrow. D. J. O. Brandt. *New Scientist,* v. 2, Aug. 8, 1957, p. 14-17.

Traditional British methods contrasted with new and old Continental processes. (D general; ST)

267-D. Some Major Advances in Blast Furnace Practice. S. N. Sircar. *Science and Culture,* v. 22, May 1957, p. 588-594.

Historical review; survey of modern practice. 20 ref. (D1, A2)

268-D. Chemical Capping Cuts Drawing Rejects. John S. McNairn. *Steel,* v. 141, Aug. 26, 1957, p. 76-78.

Chemical capping of rimming steel ingot cut down percentage of scrap and gave uniform chemistry at Ford steel plant. (D9k; ST-d)

269-D. More Jobs Open for Rare Earth Additives. *Steel,* v. 141, Sept. 9, 1957, p. 112-115.

Addition of 5 lb. of misch metal per ton of stainless steel in the ladle results in improved strength and ductility, control of tramp elements, decrease in scrap losses, grain refinement and a saving of $80 per ton of steel. (D9r; SS, EG-g)

270-D. Heat Over Checkers Speeds Light-Up. *Steel,* v. 141, Aug. 19, 1957, p. 158-161.

Burning gas on top of checkers can cut 6 to 12 hr. off time needed in lighting openhearth furnace. (D2h)

271-D. (French.) **Chronicle of Steelmaking. From Carbon Steel to Electric Steel.** G. Grenier. *Echo des Mines et de la Metallurgie,* no. 3501, Feb. 1957, p. 91-92.

Historical listing and brief comment on processes and equipment. (D general, A2; ST)

272-D. (French.) **Chronicle of Steelmaking. Application of Concentrated Oxygen in the Manufacture of Steel.** G. Grenier. *Echo des Mines et de la Metallurgie,* no. 3502, Mar. 1957, p. 147-149.

Summary of first uses of concentrated oxygen after World War I and of developments in use of different types of furnaces and in different countries. 10 ref. (D10; ST)

273-D. (French.) **Partial Replacement of Metallurgical Coke by Reducer Gas in Blast Furnaces.** Ladislas Naszalyi. *Revue de l'Industrie Minerale,* v. 39, May 1957, p. 423-435.

On basis of uncompleted experimental work with small furnace (approx. 16 ft. high by 23 ft.), at least one way was found to reduce quantity of coke previously required for ore reduction. 8 ref. (D1b; Fe, AD-r, RM-j 43)

274-D. (German.) **Influence of Hydrogen Additions to Reducing Gas on the Increase of Degree of Reduction of Indigenous Iron Ores.** Horst Braun

and Kurt Wachtl. *Neue Hütte,* v. 2, June 1957, p. 333-340.

Ores tested; softening points in air and in the reducing gas flow; gases used; sampling; determination of the degree of reduction; test data and analysis; comparison of values calculated; critical consideration of thermodynamic calculations; effects upon blast furnace operation. 16 ref. (D1b, D11g; Fe, RM-n)

275-D. (German.) **Porosity of Steel Ingots 300 Kilos in Weight of C22 Quality Used for the Production of Wheel Disks.** Georg Wycisk and Otto Kramer. *Neue Hütte,* v. 2, June 1957, p. 341-346.

Pore formation; influence of melting method; influence of deoxidation; influence of the killing time in the furnace after previous deoxidation; tapping time; influence of furnace conditions and pouring methods. (D9, D general; ST, 5-9, 9-18)

276-D. (German.) **Influence of Steel Impurities on the Remagnetization Losses of Hot Rolled Transformer Sheets.** Theodor Brüggemann. *Neue Hütte,* v. 2, July 1957, p. 404-409.

Manufacturing transformer steel; sheet bar and sheet treatment in the rolling mill; description of unsuitable transformer steel treatments in the rolling mill and annealing department. 5 ref.
(D general, F23, P16; ST, 4-3)

277-D. (German.) **Crude Coal Tar Firing of Openhearth Furnaces.** Wilhelm Gerling and Karl-Otto Zimmer. *Stahl und Eisen,* v. 77, Aug. 8, 1957, p. 1075-1080.

Appearance of the crude tar flame in the furnace using the Stec-Blaw-Knox burner, with atomization by preheated compressed air at 200° C. and 6 atmospheres; capacity and consumption figures of the tar-fired furnace; influence of the crude tar use on the melting process; difficulties encountered in operation and their removal; sulphur contents of the melt in triple-gas fired furnaces compared with those in the furnace fired with crude tar; differences in the behavior of the crude tar-fired furnace as against that of of a gas-fired furnace.
(D2, 1-2; RM-j, RM-m)

278-D. Oxidation of Liquid Steel During and After Tapping From an Openhearth Furnace. N. S. Mikhailets. *Stal',* v. 16, 1956, p. 214-216. (*Henry Brutcher Translation* no. 3822.)

Magnitude of loss of deoxidizers (and alloying elements) owing to oxidation outside the openhearth furnace; numerical data on manganese losses in rimming plain carbon steels inside and outside the furnace; detection of the point at which most of this external loss occurs; effect of duration of tap upon total manganese and silicon losses; importance of the conditions of tapping, especially the state of the taphole which controls the duration of the tap as well as the character of the stream of metal being run out of the furnace. (D9n, D2; ST)

279-D. (Book.) **Boron, Calcium, Columbium, and Zirconium in Iron and Steel.** Engineering Foundation. 533 p. 1957. John Wiley & Sons, Inc., 440 Fourth Ave., New York 16, N. Y. $14.

Fourth book in the Alloys of Iron New Monograph Series. Collection of four monographs on effects of these alloying metals on iron and steel. Monographs separately abstracted.
(D11, 2-10; ST, *B, Ca, Cb,* Zr)

280-D. American Stainless - Steel Melting Practice. *Foundry Trade Journal,* v. 103, Aug. 15, 1957, p. 203.

Summarizes process for recovery of chromium, manganese, and iron which enter slag during stainless steel melting.
(D11s, A11d; SS, Cr, Mn, Fe, RM-q)

281-D. Carbon Linings Stand Up to Long Furnace Campaign. *Iron Age,* v. 180, Aug. 29, 1957, p. 74.

Carbon hearth lining gives good service during long blast furnace campaign. (D1, W17g, RM-h)

282-D. The Liquidus and High-Temperature Properties of Blast-Furnace Slags. B. G. Baldwin. *Iron and Steel Institute, Journal,* v. 186, Aug. 1957, p. 388-395.

Technique permitting observation of crystal growth, melting or movement of molten slag at temperatures up to 1750° C. used for measurement of liquidus temperatures of 150 blast furnace slags. Actual temperatures close to those predicted for slag composed of CaO, MgO, Al_2O_3 and SiO_2. Relation between temperatures and slag viscosity. 21 ref. (D11q, D1b; RM-q)

283-D. Heat Flow in Ingot Hot-Tops. G. Fenton. *Iron and Steel Institute, Journal,* v. 186, Aug. 1957, p. 396-405.

Study of heat flow and balance in hot-tops of 9-in. square ingot molds over full period of steel solidification with standard firebrick and insulating brick hot-tops. Thermal capacity of refractory accounts for greatest proportion of heat loss. General recommendations for improved feeding efficiency.
(D9, P11k; ST, 5-9)

284-D. Increasing Blast Furnace Output. Charles M. Squarcy and Richard J. Wilson. *Metal Progress,* v. 72, Sept. 1957, p. 210-212, 216. (Digest from "More Iron Without More Furnaces", American Iron and Steel Institute, Regional Meeting, Chicago, Oct. 17, 1956, 26 p.)

The application of several improvements to the eight blast furnaces at Inland Steel Co. Gives concrete information as to the benefits gained. A ten-year period (1947 to 1956) is covered. (D1b, Fe)

285-D. More Jobs Open for Rare Earth Additives. *Steel,* v. 141, Sept. 9, 1957, p. 112-115. (CMA)

Advantages of lanthanum additives in steelmaking include improvement in tensile, stress and impact properties, decreased hot shortness in high-alloy stainless, better nodule formation in cast iron, and control of tramp elements. Some evidence exists for grain refinement, scale suppression in forging and control of oxygen, sulphur and hydrogen. Experiences of steelmaking firms are cited.
(D9r, Q general, 2-10; ST, EG-g, AD-p)

286-D. (Czech.) **Advantages of Automatic Flame Reversal in Openhearth Furnaces.** Vaclav Parma. *Hutnické Listy,* v. 12, no. 7, 1957, p. 578-585.

Principle of flame reversal and individual systems for automatic reversal; examples show improved heat work and longer checker life and simplified furnace operation upon introduction of automatic flame reversal; reversal graphs for counter current gas. (D2h)

287-D. (Czech.) **Compiling and Evaluation of Heat Balances of Openhearth Furnaces.** Vladimir Balabanov. *Hutnické Listy,* v. 12, no. 7, 1957, p. 604-609.

Methods of temperature measurement; necessity of standardization in measuring and compiling heat balances in openhearth furnaces; data on heat balance of an openhearth. (D2h)

288-D. (French.) **Recent Developments in Blast Furnace Practice.** A. Roos. *Genie Civil,* v. 134, June 15, 1957, p. 269-277.

Chemical potential; fundamental blast furnace reactions; internal thermal mechanism of blast furnaces; relation between slag temperature and composition of reduced metal; study of stack process by means of radioactive isotopes; factors governing coke consumption; thermal balance of coke combustion. (D1, D11n; Fe)

289-D. (French.) **Economic Aspects of the Direct Reduction of Iron Ores.** R. Touttee. *Revue de l'Industrie Minerale,* v. 39, June 1957, p. 547-567.

Definition of direct reduction and economic factors governing advisability of use; technique of direct reduction, including various processes and applications in France and elsewhere; comparison with other methods for decreasing coke consumption; comparison of efficiency of direct reduction in France and U. S. A.; direct reduction and selling price-investment-balance of foreign trade picture. (D8j, A4; Fe)

290-D. (German.) **Influence of Catalysts on the Reduction of Iron Ore With Hydrogen.** Willi Machu and Said Y. Ezz. *Archiv für das Eisenhüttenwesen,* v. 28, July 1957, p. 367-371.

The catalytic effect of 100 substances on the reduction of iron ore was investigated. Copper, nickel and platinum have positive, tungsten has negative effects. However, these effects show up only in a temperature range of 250 to 400° C. Roasting temperature after catalyst impregnation and the concentration of the catalyst are of definite importance. 10 ref. (D8j; Fe, NM-c)

291-D. (Russian.) **Blast Furnace Operation Under 1.3 Atm. Gage Top Gas Pressure.** E. G. Tetereviatnikov and V. N. Andronov. *Stal',* v. 17, March 1957, p. 200-204.

The first experiment with blast furnace operation under high top-gas pressure (up to 1.3 atm.) resulted in an improvement of the consumption coefficients of raw materials and an increase of the furnace productivity; however, this was limited by a rather poor preparation of raw materials for smelting and inadequate capacity of the hot-blast stoves. (D1h, 1-2; Fe)

292-D. (Russian.) **Gas Temperature at Working Space Outlet of an Open-**

hearth Furnace. V. N. Kornfeld, A. O. Voitov and V. I. Koshelev. *Stal',* v. 17, March 1957, p. 213-219.

Systematic measurement of gas temperatures of an openhearth furnace, when melting heats with and without oxygen enrichment reveals regularity in variations, characterizing the heat exchange process in the working space of the furnace. By means of the gas (smoke) control an effective automatic regulation of the thermal regime is possible. 11 ref. (D2h, S16)

293-D. (Russian.) **Rise of Temperature of Openhearth Bath on Blowing With Compressed Air.** M. Ia. Medzhibozhsky and I. A. Sokolov. *Stal',* v. 17, March 1957, p. 220-227.

When blowing compressed air into the openhearth bath, the oxidation of carbon in the metal takes place mainly due to the oxygen being heated to 1700° C. and absorbed by the bath from the furnace atmosphere. An essential thermal effect of the reaction is an improvement of the heat transmission from the flame to the bath, which is agitated vigorously by the air blown in, resulting in a sharp rise of the metal temperature and the rate of its superheating. 8 ref.
(D11p, D2g; ST)

294-D. (Russian.) **Application of Calculating Machines to the Automatic Control of Blast Furnaces.** I. A. Rylov. *Stal',* v. 17, June 1957, p. 488-493.

In the complex control system of the blast furnace it appears expedient to use calculating machines intermittently, since they perform counting operations and other elementary functions. (D1, X14, 1-2)

295-D. (Russian.) **Automatic Loading and Weighing of the Blast Furnace Burden at the Charging Skips of the Belt Conveyer.** A. A. Ganich, V. F. Zarubin and V. G. Yakovlev. *Stal',* v. 17, June 1957, p. 496-500.

Operation of one blast furnace at Magnitogorsk indicates that the replacement of the scale-cars for loading and weighing by stationary weighing hoppers at the charging skip of the belt conveyer has increased the productivity of the charging equipment. There is also a reduction of metal used for the corresponding structures.
(D1b, W12b, 1-2)

296-D. (Russian.) **Ball Bearing Steel Melting in the Acid Openhearth Furnace.** P. P. Semenenko, M. M. Golovanov and I. G. Fadeev. *Stal',* v. 17, June 1957, p. 503-507.

An improvement in the technical melting practice for ball bearing steel in the Serov acid openhearth furnace reduces the nonmetallic contamination; an approximation of electric furnace steel is obtained. (D2, 1-14; ST, SGA-c, 3-19)

297-D. (Russian.) **On the Nature of Killed Steel Ingots.** A. N. Lekontsev. *Stal',* v. 17, June 1957, p. 512-513.

Study of an experimental killed steel ingot weighing 1550 kg. Five conclusions given for obtaining improved weight and quality of an ingot of killed steel. 5 ref.
(D general, ST-c, 5-9)

298-D. (Russian.) **Injection of Oxygen into the Gas Port of Openhearth Furnaces.** V. A. Makovskii and Ch. A. Okinchits. *Stal',* v. 17, June 1957, p. 513-516.

Tests designed to speed up the process using technical grade (85-93%) oxygen injected into the gas port. The mathematics involved; schematic and cross-sectional drawings of the injector. (D2g, W18g, 1-2)

299-D. (Russian.) **On the Question of Conversion of High-Phosphorus Iron in the Tilting Openhearth Furnace.** E. V. Tretyakov and V. A. Makovskii. *Stal',* v. 17, June 1957, p. 517-519.

Results of tests run on a 350-ton Talbot-process type furnace. 4 ref. (D2, 1-2, Fe, *P,* ST)

300-D. (Russian.) **New Method of Deoxidation and Desulfurization of Steel for Improvement of Quality.** V. A. Skachko and N. P. Merenkov. *Stal',* v. 17, June 1957, p. 521-522.

Experimental melts of steel are described giving a new method of deoxidation and desulphurization by means of aluminum. 8 ref.
(D9r: ST, *Al*)

301-D. (Russian.) **Method of Making Flat Ingots.** I. D. Kuzema. *Stal',* v. 17, June 1957, p. 541-543.

New method of making flat ingots giving the mathematical use of coefficients depending on dimensions of the sheets required. Significant reduction in metal consumption per ton of the acceptable sheet is realized. (D9, F23, 5-9, 4-3)

302-D. (Russian.) **Influence of Technological Factors of Melting and Pour-**

ing on Fine Cracks in 1-2X13 Steel. M. I. Vinograd, G. S. Chernyak and N. D. Orekhov. *Stal',* v. 17, June 1957, p. 560-562.

A considerable reduction in fine cracks is achieved by use of ingot heads from siphoned bottom-poured metal, when the temperature in the ladle after tapping is held to 1550 to 1650° F. (D9m; ST, 5-9, 9-22)

303-D. Steelmaking Plans for Tomorrow. P. M. Unterweiser. *Iron Age,* v. 180, Sept. 19, 1957, p. 139-144.

Recent developments in steelmaking including direct reduction processes, alkali desulphurization processes and continuous casting setups. (D general)

304-D. Pouring of Steel Ingots With Electric Arc Heating of Their Heads. B. N. Popov. *Metallurg,* v. 1, no. 9, 1956, p. 19-22. (*Henry Brutcher Translation* no. 4029.)

Design of industrial-scale equipment for arc heating of the tops of steel ingots with sonic-frequency a.c. Technique of arc heating; suitable ingot sizes. Comparison of primary pipe obtained when bottom pouring ingots without and with arc heating of their heads. (D9p, 1-2; ST)

305-D. (Czech.) **Artificial Blast Furnace Wind Wetting.** Miroslav Prouza. *Hutnické Listy,* v. 12, no. 2, 1957, p. 97-102.

Observations on effect of water vapor addition to blast furnace blast on material and thermal balances and oxidation reduction processes; amount of moisture added determined by stove capacity, climatic conditions and types of control equipment available. 4 ref. (D1b)

306-D. (Czech.) **Continuous Steel Casting in the USSR.** M. S. Bojcenko and V. S. Rutes. *Hutnické Listy,* v. 12, no. 6, 1957, p. 500-509.

Industrial units for continuous steel casting; details of pouring; steel casting equipment; drawing of semifinished product from ingot mold. (D9q, 1-2; ST)

307-D. (French.) **Use of Natural Gas in Reduction of Iron Ores.** J. Raffin. *Annales des Mines,* June 1957, p. 345-352.

Höganäs, Wiberg, Krupp-Renn processes of so-called "direct ore reduction"; physical chemistry of reduction by gases and use of natural gas; cracking of methane; hydrogen reduction, H-iron process, ONIA process; economic aspects of gas-producing materials in Western Europe; prospects for future development and use of processes covered. 7 ref. (D8j; Fe, RM-n)

308-D. (French.) **New Perspectives in Thomas Steel Production.** Marc Allard. *Société des Ingenieurs Civils de France, Memoires,* v. 110, May-June 1957, 194-199.

Recent improvements in Thomas process provide more accurate metallurgical control, hence better steels, thereby improving market position of plants using this process. (D3; ST)

309-D. The Changing Openhearth Picture. Kenneth C. McCutcheon. *Industrial Heating,* v. 24, Aug. 1957, p. 1571-1580.

Data comparing size of heats, productivity for different furnace sizes, firing rate and other changes in openhearth practice between 1947 and 1956. (D2; ST)

310-D. New Hot Top Cuts Ingot Discard in Half. William Czygan. *Iron Age,* v. 180, Sept. 12, 1957, p. 123-126.

Vallak, the Swedish developed hot top, keeps steel in feeder head molten long enough to prevent shrinkage cavities in piping. Heat produced by combustion of carbonaceous material in hot top. Sand or other refractory coatings prevent contamination of steel by hot top. (D9k, 1-2; ST)

311-D. The 48th BISRA Steelmaking Conference. Pt. 2. Recent Developments in Openhearth Practice Abroad and at Home. *Iron and Coal Trades Review,* v. 174, Sept. 20, 1957, p. 685-690.

Highlights of papers and discussion at 2nd of three sessions of conference held by British Iron and Steel Research Assoc. at Ashorne Hill on May 8, 9, 1957. Covers flush slag practice, use of cupola, developments in Germany and Russia, practice at modern British plants, —all as related to increased productivity in openhearth steelmaking. (D2; ST)

312-D. Fuel's Contribution to Increased Openhearth Capacity. C. W. Dunn. *Iron and Steel Engineer,* v. 34, Aug. 1957, p. 57-64.

Arrangement of openhearth furnace, types of burners, handling of

fuel oil, layout of instruments and control panel for following combustion variables. Study of fuel rate, air rate, steam rate, furnace pressure, roof temperature, oxygen and waste gas temperature, in achievement of good furnace performance. (D2, 1-2; ST)

313-D. Increasing Openhearth Capacity by Extending the Hearth. Charles D. Guth. *Iron and Steel Engineer,* v. 79, Sept. 1957, p. 64-69.

Case history of hearth extension increasing openhearth furnace capacity. (D2, 1-2)

314-D. Increasing the Capacity of an Openhearth Shop. M. K. Morris. *Iron and Steel Engineer,* v. 34, Aug. 1957, p. 69-72.

Openhearth capacity increased by adding 3 in. of bath depth in furnaces and extending auxiliary facilities. (D2, 1-2)

315-D. Economics of the New Iron Ore Reduction Processes. E. C. Wright. *Metal Progress,* v. 72, Oct. 1957, p. 99-104.

A ton of steel from all direct iron processes requires at least 4,000,000 Btu. more energy than from the conventional blast furnace and openhearth, and consequently a direct iron plant must be located where electricity or gas is very cheap and coke is very dear. There is little difference in capital costs per ton of product per year. (D8, B15; Fe, RM-n)

316-D. On the Basic Pneumatic Processes of Steelmaking. P. Coheur and H. Kosmider. *Blast Furnace and Steel Plant,* v. 45, Oct. 1957, p. 1131-1139.

Tests undertaken on ductility and weldability of steel made by pneumatic processes indicate that basic converter steel is as good as openhearth steel. 62 ref. (D3, 1-15, Q23p, K9s; ST)

317-D. Trends in Electrification and Automation of Iron and Steel Processes. W. E. Miller. *Iron and Steel Engineer,* v. 34, Oct. 1957, p. 83-94.

Process and electric system relationship is analyzed. A basic automated process includes regulating systems, automatic inspection, automatic data logging, automatic data processing, programming, computing and reprogramming. (D general, 18-24)

318-D. Vacuum Stream Degassing Is New Tool for Steel Plant Engineers. K. C. Taylor. *Iron and Steel Engineer,* v. 34, Oct. 1957, p. 142-144.

Vacuum pouring is the most economical and dependable way to reduce and control gaseous inclusions in steel. Improvements which degassing achieves in the physical properties of steel. (D9s, 1-23; ST)

319-D. Lithium-Based Grease Reduces Blast Furnace Lubrication Costs. *Iron and Steel Engineer,* v. 34, Oct. 1957, p. 162-164. (D1; NM-h, Li)

320-D. Studies on Ingot Feeder Heads. H. S. Marr, G. Fenton and W. H. Glaisher. *Iron and Steel Institute, Journal,* v. 187, Oct. 1957, p. 81-92.

Methods of increasing efficiency of feeder heads for killed steel ingots. Hot top lining needs to have low heat capacity to give high efficiency. Recommendations for improving yields from hot topped ingots. (D9, W19c; ST)

321-D. Similarity Criteria for Dust-Deposition Tests in Models. R. A. Granville, A. Sigalla and Hope Lubanska. *Iron and Steel Institute, Journal,* v. 187, Oct. 1957, p. 121-125.

Application to the conduct and interpretation of openhearth furnace dust deposition and flow-visualization tests. 9 ref. (D2, A8a)

322-D. Economics of Continuous Casting in a Converter Steel Plant. J. Savage and J. S. Morton. *Journal of Metals,* v. 9, Aug. 1957, p. 1052-1056.

Process is particularly suitable for integration with converter and electric-arc furnace steelmaking. Capital and operating costs; comparison of costs between this method and conventional practice. 9 ref. (D9q; ST)

323-D. Continuous Casting of Three Types of Low-Carbon Steel. F. G. Jaicks, L. E. Kraay and M. Tenenbaum. *Journal of Metals,* v. 9, *AIME Transactions,* v. 209, Aug. 1957, p. 1057-1072.

Experimental studies carried out at Inland Steel utilized a Rossi-type plant with a Junghans reciprocating mold system. Casting facilities, types of steel used, general sequence of casting plant operations and plant capacity. 20 ref. (D9q; CN-g)

324-D. (French.) **Chronicle of Steel Making: Iron Ore Reduction Proc-**

esses. G. Grenier. *Echo des Mines et de la Metallurgie,* no. 3507, Aug. 1957, p. 458-460.

Brief summary of reduction principles and phenomena; types of furnaces used in fusion processes; processes not utilizing fusion and equipment used. (D general; RM-n, Fe)

325-D. (French.) **Rationalization of the Thomas Process.** J. Marot. *Silicates Industriels,* v. 22, Sept. 1957, p. 468-474.

Research undertaken at Hainaut Section of National Center for Metallurgical Research envisages improved process control and better understanding of metallurgical process of conversion. Problems encountered and results obtained to date. 15 ref. (D2)

326-D. (French.) **Development of Capacity of Martin Furnaces in France.** M. Mallevialle. *Technique Moderne,* v. 49, July 1957, p. 335-338.

Martin furnace operating conditions in France are not favorable for development of capacities comparable to those of American or Russian furnaces. Even when heating power can be obtained by use of rich fuels, or reinforced by use of oxygen, charging speed becomes insufficient because quality of raw materials is inferior. It is thus not possible to use furnaces, even of average tonnage, to maximum of their possibilities. (D2; ST)

327-D. (Russian.) **Investigation of Heat Exchange and Reduction Processes Involved in Using Fluxed Sinters in Blast Furnaces.** N. N. Babrykin and F. A. Yushin. *Stal',* v. 17, Jan. 1957, p. 7-15.

By changing from the usual agglomerate to hot, fluxed sinters with practically complete elimination of raw fluxes from the charge, blast furnace production was raised 12.2% and coke consumption reduced by 11.1%. (D1a; Fe, RM-q)

328-D. (Russian.) **Automatic Control of Blast Furnaces.** G. G. Pietrokovskii and F. V. Ashikhmin. *Stal',* v. 17, Jan. 1957, p. 16-20.

The operation and production of the Magnitogorsk Metallurgical Combine was considerably improved by introduction of automation. Such important functions of the furnaces as gas pressure, hot blast humidity and stove temperature are automatically controlled. (D1b, 18-24)

329-D. (Russian.) **Fluxed Sinters With Increased Magnesia Content.** A. I. Gamayurov and A. G. Neyasov. *Stal',* v. 17, Jan. 1957, p. 20-24.

Laboratory tests indicate that it is desirable to increase magnesia content in fluxed sinters of sulphorous ores to promote their reducibility. 5 ref. (D1a, B16a; Fe)

330-D. (Russian.) **Hydrodynamics of Liquid Steel in Molds.** A. A. Zborovskii, L. K. Strelkov, M. K. Skulskii and E. I. Rabinovich. *Stal',* v. 17, Jan. 1957, p. 24-30.

Investigations by radioactive tracers indicate turbulence during the process of solidification. Flow patterns in rimming and killed steels have different directions. 6 ref. (D9k, 1-4; ST)

331-D. (Russian.) **Investigation of Liquid Steel Temperatures.** D. K. Pugachev. *Stal',* v. 17, Jan. 1957, p. 30-34.

By using immersion thermocouples the most favorable temperature in a massive openhearth heat before deoxidation was determined. This enabled the pouring of a larger quantity of better ingots. (D2c, X9q, 1-2; ST)

332-D. (Russian.) **Influence of Technological Factors on Contamination of ShX15 Steel.** M. I. Zuev, D. P. Zhuravskii, M. I. Vinograd and M. A. Lyubinskaya. *Stal',* v. 17, Jan. 1957, p. 43-47.

Oxide inclusions can be held to a minimum if the brick lining of the furnace is sound; if the ladle temperature is held between 1530-1580° C., if the steel is poured from the bottom of the ladle to fill the mold in 80-100 sec. (D2; ST, 9-19)

333-D. (Russian.) **How Deoxidation With Aluminum Affects the Quality of Constructional Steel.** N. G. Antropova, Z. M. Kalinina and A. K. Petrov. *Stal',* v. 17, Jan. 1957, p. 64-69.

Unconsumed aluminum which is added to the steel for final deoxidation forms nitride films at the grain boundaries. These influence the ductility, texture of fracture and other properties of the rolled steel. 9 ref. (D11r; ST, *Al,* AD-r)

334-D. (Russian.) **Smelting of Fluxed Sinters of Krivoy Rog Ore in the Blast Furnace.** I. V. Raspopov, Ya. P. Kulikov, Ya. S. Gorbanev and G. D. Muguev. *Stal',* v. 17, Feb. 1957, p. 99-103.

The use of ordinary sintered ore in place of fluxed sinters reduced

coke consumption by 16%, and the cost of metal production by 10% with accompanying minimization of fuel dust losses.
(D1a, B16a; Fe, RM-n)

335-D. (Russian.) **Ferro-Coke and Ore-Coal Briquettes.** M. S. Kurchatov. *Stal',* v. 17, Feb. 1957, p. 103-105.

Thermostability tests in reducing atmosphere have shown the superiority of ore-coal briquettes over those of ferro-coke. The ore-coal ratio is in accordance with requirements for reduction. 6 ref.
(D1a; Fe)

336-D. (Russian.) **Character of Openhearth Steels Produced With Oxygen.** D. S. Kazarnovskii, T. M. Ravitskaya, M. P. Sidelkovskii and L. P. Tarasova. *Stal',* v. 17, Feb. 1957, p. 152-157.

Use of oxygen does not adversely affect the physical properties of rail steel or the quantity of gaseous and nonmetallic inclusions.
(D2q; Q general, ST-e)

337-D. (Russian.) **Remelting of High-Manganese Steel in the Openhearth.** P. T. Khokhlov. *Stal',* v. 17, Feb. 1957, p. 179-181.

New methods of melting high-manganese steel scrap result in a saving of manganese and a product relatively free from hot cracks.
(D2; ST, *Mn,* RM-p)

338-D. (Russian.) **Prospects of Pig Iron Production in Electric Furnaces.** A. G. Gerasimov. *Stal',* v. 17, July 1957, p. 577-579.

Excessive electric power demand of pig iron production in electric furnace due to high conductivity of the ore is the main limiting factor of the wider application of the process. Results of the process carried out in 250 and 5500-kw. furnaces. 6 ref. (D8n, Fe, RM-n)

339-D. (Russian.) **Ferromanganese Smelting in a Large Blast Furnace.** A. F. Zakharov, F. A. Khilkevich, S. V. Brazilevich and B. L. Lazarev. *Stal',* v. 17, July 1957, p. 580-584.

Details of ferromanganese smelting in a 1100-cu. m. blast furnace with high-temperature blast, slight oxygen enrichment (24.3%), high pressure of gases (0.5 atm.) and acidic slags (SiO_2, Al_2O_3-45%). The process allows a comparatively high utilization of manganese and insures good coke consumption rate. 5 ref.
(D1; Fe, Mn, AD-n)

340-D. (Russian.) **Increase of Metal Output by Heating of Ingot Heads.** N. P. Zhetvin, A. A. Lebedkov, V. P. Tunkov and A. D. Zaitseva. *Stal',* v. 17, July 1957, p. 587-592.

Method of intensive heating of ingot and shaped cast iron hot tops. The process reduces the weight of ingot heads. (D9; ST)

341-D. (Russian.) **Analog and Regulating Computers for Electric Arc Steel Furnaces.** Yu. E. Efroimovich. *Stal',* v. 17, July 1957, p. 602-608.

Influence of the useful power and short grid parameters variation upon efficiency of the electric-arc furnace. Perfection of the electric-arc furnace process by application of analog computers in control of the electric parameters.
(D5, X14j, 1-2)

342-D. (Russian.) **Automatic Control of Complex Mixtures Combustion in Metallurgical Plants.** A. Ya. Lerner. *Stal',* v. 17, July 1957, p. 651-655.

Application of automatic computing devices in control of combustion of gases where the quantities of the components are measured by induction or rheostat transducers.
(D11j, X14, 1-2)

343-D. (German.) **Dephosphorization Before the Decarburization During the Refining of Pig Iron by Pure Oxygen.** Hans Kosmider, Herbert Neuhaus and Hermann Schenck. *Stahl und Eisen,* v. 77, Sept. 19, 1957, p. 1277-1283.

Blowing methods; dephosphorization by indirect oxidation in the slag phase (buffer slag-oxidation process); characteristics of the process include desulphurization and prevention of the formation of brown waste gases. 9 ref. (D10, D11r; ST)

344-D. (German.) **Refining Basic Bessemer Pig Iron by Blowing With Pure Oxygen.** Friedrich A. Springorum, Karl G. Speith, Otto Darmann and Hans vom Ende. *Stahl und Eisen,* v. 77, Sept. 19, 1957, p. 1284-1296.

Plant operation and production of salable steel by blowing pure oxygen onto basic bessemer pig iron; blowing, dephosphorization and resultant alteration of carbon, silicon, manganese and nitrogen content; ore or scrap addition; relationship between phosphorus content of the bath, the iron content of the slag and temperature; and effect of carbon content; slag and waste gas composition; wear on the converter and life of refractory lining. 17 ref.
(D3f; ST)

345-D. (German.) **Oxygen Refining of Pig Iron Rich in Phosphorus.** Heinrich Rellermeyer, Helmut Knuppel and Johann Sittard. *Stahl und Eisen,* v. 77, Sept. 19, 1957, p. 1296-1303.

Refining in the L-D converter; dephosphorization; top blowing; blowing with one or three oxygen lances; simultaneous blowing from the bottom; top blowing with simultaneous hot metal pouring. 12 ref.
(D10a; ST)

346-D. (German.) **Mechanism of Top Blowing.** Rudolf Hammer, Theo Kootz and Johann Sittard. *Stahl und Eisen,* v. 77, Sept. 19, 1957, p. 1303-1308.

Action of the free jet of oxygen-bearing gases on the surface of a fluid; entrainment of liquid drops by the deflected jet; power and power losses of the jet. 7 ref.
(D10a; ST)

347-D. (German.) **Refining With Oxygen in the Rotary Furnace by the Kaldo Process.** Bo Kalling and Folke Johansson. *Stahl und Eisen,* v. 77, Sept. 19, 1957, p. 1308-1315.

Description of first large plant at Domnarvet; development of process; reactions with basic bessemer pig iron and pig iron poor in phosphorus; life of the lining, heat economy, quality of the steel. 4 ref.
(D10a; ST)

348-D. (Book.) **Manufacture of Iron and Steel. V. 1. Iron Production.** Reginald Bashforth. 306 p. 1957. Chapman & Hall Ltd., London W.C. 2, England. $7.

Survey of modern methods of manufacture of ferro-alloys, special irons and wrought irons. Blast furnace and other methods of pig iron production are covered.
(D general; ST, CI-a)

SECTION E

FOUNDRY

1-E. Design and Production of Aluminum Castings. G. W. Birdsall. *Aero Digest,* v. 73, Nov. 1956, p. 13-19.

Data to help designers select casting process and aluminum alloy best suited for product requirements. Includes casting tolerances, corrosion resistance, fabricating characteristics, comparison of casting methods. (E general, 18-17; Al)

2-E. Gating and Risering in the Brass Foundry. Harry St. John. *Foundry,* v. 84, Nov. 1956, p. 108-111.

Considers the complex problem of feeding castings to make up for shrinkage during solidification. (E22, E25; Cu)

3-E. New Plant Produces Mercury Investment Castings. Thomas A. Dickinson. *Foundry,* v. 84, Nov. 1956, p. 133-135.

Casting technique is making possible the use of steel aircraft castings in place of forgings. Frozen mercury patterns are used to make ceramic molds into which castings are poured. (E15, W19; AY)

4-E. The Refinement of Cast Grain-Size in Copper-Aluminium Alloys Containing 7-9 Per Cent Aluminium. J. P. Dennison and E. V. Tull. *Institute of Metals, Journal,* v. 85, Sept. 1956, p. 8-10.

Introduction of selected nucleating compounds showed that in the alloys in which the α phase solidifies first, moderate refinement may be produced by additions of molybdenum, columbium, tungsten or vanadium of the order of 0.1%. (E25; AD-p35, Cu)

5-E. (Czech.) **Properties of Molding Materials at Elevated Temperatures.** Lev Petrzela. *Slévarenstvi,* v, 4, no. 10; *Prace Ceskoslovenského vyzkumu slévarenského,* v. 3, no. 36, Oct. 1956, p. 255-264.

Mold material failures are studied from 400 to 1200° C. (W19, NM-j)

6-E. (Russian.) **Sand-Resin Mixtures for Shell Molds and Cores.** I. E. Shub and P. I. Kantor. *Liteinoe Proizvodstvo,* no. 9, Sept. 1956, p. 1-5.

Present domestic and foreign practices in preparing sand-resin mixtures for shell molding. (E19c; NM-j)

7-E. (Russian.) **A Substitute for Powder Bakelite in Shell Mold Manufacture.** A. M. Liass, Ia. I. Medvedev and L. D. Snulova. *Liteinoe Proizvodstvo,* no. 9, Sept. 1956, p. 10-13.

Experimental data on the technical properties of wood-tar pitch as a substitute for phenol-formaldehyde resins in binding shell molds. Use of additional solvents with the pitch is indicated. (E19c; NM-j)

8-E. (Russian.) **Effective Use of Clay in Mixtures for Mold Manufacture.** N. A. Barinov and D. I. Manreev. *Liteinoe Proizvodstvo,* no. 9, Sept. 1956, p. 13-14.

Advantages of using clay in the suspension form instead of powder in mixtures for shell molds. (E19c; NM-h)

9-E. (Russian.) **Deformation of the Sand Mold During Steel Casting.** A. M. Dubrovskii. *Liteinoe Proizvodstvo,* no. 9, Sept. 1956, p. 22-26.

Effect of the deformation of mold mixture with temperature on the development of internal stresses in the castings. (E23, Q25; ST)

10-E. Control of Shrinkage Defects in Cast Iron. I. John Allan. *Canadian Metals,* v. 19, Nov. 1956, p. 36, 38, 40, 42.

Types of shrinkage, gating and metal composition, pouring, metal temperature, melting conditions, sand deformation. (To be concluded.) (E25n, 9-18; CI)

11-E. New Plant for Super-Alloy Production in Canada. G. W. Paget. *Canadian Metals,* v. 19, Nov. 1956, p. 54, 56, 58.
Standard sand molding techniques, shell molding, lost wax process, and Shaw process are used. Stellite facing increases service life of parts produced. (E general; SG-h)

12-E. Shrinkage in Gray Cast Iron. John Allan. *Foundry,* v. 84, Dec. 1956, p. 88-95.
Methods of casting, problems and defects of shrinkage, controlled progressive solidification. Recommendations for solving these problems. (E25n, 9-18; CI)

13-E. Brass Foundry Molding. Harry St. John. *Foundry,* v. 84, Dec. 1956, p. 104-107.
Basic fundamentals of grain size and shape, bonding materials, additives and processing as they affect molding sands. (E18p; Cu)

14-E. Dimensioning of Risers for Nodular Iron Castings. H. F. Bishop and C. G. Ackerlind. *Foundry,* v. 84, Dec. 1956, p. 115-119.
System for determining smallest risers which can be employed on nodular iron castings with underriser shrinkage. (E22q; CI)

15-E. Melting by Induction. II. High Frequency Furnace Applications. Frank T. Chestnut. *Industrial Heating,* v. 23, Nov. 1956, p. 2356 + 6 pages.
Application of high-frequency furnace for melting steels, copper alloys and other metals. (E10r; ST, Cu)

16-E. Holding Close Tolerances on Die-Cast Parts. H. K. Barton and L. C. Barton. *Machinery,* v. 63, Dec. 1956, p. 182-188.
Causes of dimensional errors, checking for errors of alignment and concentricity, correction and inspection of die-cast parts, gaging fixture for an instrument frame, importance of "realistic" dimensioning, checking screw threads. (E13, S14)

17-E. New High-Strength Copper Alloy. J. F. Klement and N. A. Birch. *Metal Progress,* v. 70, Nov. 1956, p. 106-109.
New British aluminum bronze containing 12% manganese has better casting properties and more attractive mechanical properties than the conventional high-strength bronzes. (E general, Q general; Cu)

18-E. Melting Metal With Sun-Power. D. C. Halacy, Jr. *Modern Castings,* v. 30, Dec. 1956, p. 28-29.
In the United States, Convair uses the solar furnace in work with metals, "cermets", ceramics, zirconium dioxide, boron nitride and other materials. General Electric purifies phosphors for use in communications equipment. (E10b, 16-13)

19-E. How to Improve Foundry Layout. Roger B. Sinclair. *Modern Castings,* v. 30, Dec. 1956, p. 35-46.
Benefits of a good layout include labor costs, materials handling, flexibility and economy. How to plan a layout, methods of applying plans. (E general, A5)

20-E. Choke That Gate. Charles V. Knobeloch. *Modern Castings,* v. 30, Dec. 1956, p. 48-50.
The proposed gating system in regulating metal flow in casting procedures should be as automatic in control functions as possible to eliminate variables. Methods and plans are presented. (E22p)

21-E. (German.) **Light Metal Casting.** H. F. Freres. *VDI Zeitschrift,* v. 98, no. 31, Nov. 1956, p. 1770-1771.
Continuous die casting of finned pipes of pure aluminum of optional length. (E13; Al)

22-E. (German.) **Progressive Casting and Molding Methods.** F. Pölzguter. *VDI Zeitschrift,* v. 98, no. 31, Nov. 1956, p. 1772-1774.
Various German processes were studied, such as the centrifugal casting method for pipes and barrels, the carbonic acid freezing method for compact molds, and precision casting. (E14, E15)

23-E. Effect of Vibrations During Solidification on the Mechanical Properties of Castings of Gas-Turbine Materials. Jerzy Jagaciak and Josiah W. Jones. *Foundry Trade Journal,* v. 101, Nov. 22, 1956, p. 595-603.
Tests on H.R. Crown Max and Nimonic C75 show an over-all improvement in properties. (E25n, Q general; Ni, SG-h)

24-E. (English.) **Gas Pressure in Mold Cavity. I.** Mototaka Mutaguchi. *Castings Research Laboratory, Report, Waseda University,* 1956, no. 7, p. 29-32.
Relation between pressure and permeability, temperature and permeability, and temperature and mean molecular weight. (E25q, 3-24)

25-E. (English.) **Inorganic Binders for Molds; Especially on Soda Silicate Prepared for the CO_2 Process.** Hisao Miyasaka. *Castings Research Laboratory, Report, Waseda University,* 1956, no. 7, p. 33-40.
Experiments with four different types of water glasses; chemical reaction involved. (E18n; NM-j45)

26-E. (Russian.) **Use of Oxygen in Cast Iron Production.** L. I. Levi.

Liteinoe Proizvodstvo, no. 10, Oct. 1956, p. 1-5.

Method of introducing oxygen into a cupola furnace through a forehearth; advantages. (E10a; CI, O)

27-E. (Russian.) **Simultaneous Modification and Degasification of Aluminum Alloys.** A. A. Gorshkov and V. G. Korotkov. *Liteinoe Proizvodstvo,* no. 10, Oct. 1956, p. 6-9.

Consists of adding low-melting chlorides instead of the metals or their alloys. (E25s; Al, AD-p)

28-E. (Russian.) **Production of Overheated Cast Iron in a Magnesite-Lined Hot Blast Cupola.** F. I. Smirnov. *Liteinoe Proizvodstvo,* 1956, no. 10, Oct. 1956, p. 10-13.

Method and construction details of preheating blast air by hot exhaust gases. (E10a; CI)

29-E. **Modernized Foundry Can Turn Out 75,000 Aluminum Pistons Per Day.** George E. Toles. *Automotive Industries,* v. 115, Dec. 15, 1956, p. 56-59.

New Chrysler aluminum piston foundry at Highland Park has increased capacity about 50%. Automatic casting machines, power shears and conveyors are used. (E general, 18-24; Al)

30-E. **New Developments Studied at Fourth Annual Meeting of ICI.** *Automotive Industries,* v. 115, Dec. 15, 1956, p. 61, 161.

Glascast shell process; investment "X" process. (E16c, E15)

31-E. **Green Sand Molding of Large Steel Casting.** Charles W. Briggs. *Foundry,* v. 85, No. 1, Jan. 1957, p. 86-93.

Practices of 31 American and 2 Canadian foundries; types of sand, reclaiming sand, bonding materials, mulling conditions. (E19a; ST)

32-E. **New Mechanized Nonferrous Foundry Stresses High Quality.** Robert H. Herrmann. *Foundry,* v. 85, no. 1, Jan. 1957, p. 94-99.

Mechanized molding and sand handling in jobbing foundry producing aluminum and bronze castings. (E19, 18-24; Al, Cu)

33-E. **Brass Foundry Molding Practice.** Harry St. John. *Foundry,* v. 85, no. 1, Jan. 1957, p. 100-103.

Green sand and dry sand molding practices. (E19; Cu)

34-E. **Things to Watch in Producing Sound Investment Castings.** C. W. Schwartz. *Foundry,* v. 85, no. 1, Jan. 1957, p. 110-115.

Causes and suggested remedies of defects found by visual inspection. (E15, 9)

35-E. **Mechanization in Small Foundries.** Chester V. Nass. *Foundry,* v. 85, no. 1, Jan. 1957, p. 137-142.

Factors determining extent of mechanization. (E general, 18-24)

36-E. **Light Alloy Casting by Frozen Mercury Process.** Edward J. Vargo. *Light Metal Age,* v. 14, Dec. 1956, p. 10-11, 38.

Advantages of frozen mercury process are dimensional stability, good surface finish, ability to produce complex castings. (E15; EG-a39, Hg).

37-E. **Antifreeze Techniques for CO_2 Process.** Roy McIlrath. *Modern Castings,* v. 31, Jan. 1957, p. 36-37.

Techniques for avoiding formation of "CO_2 Snow" when introducing carbon dioxide into cores or molds. (E19, E21; RM-g)

38-E. **New Idea—Warm Blast Cupolas.** Wm. Y. Buchanan. *Modern Castings,* v. 31, Jan. 1957, p. 40.

Recuperative hot blast with modest cost heating chamber proves successful in melting cast iron borings. (E10a, W19; CI)

39-E. **Casting With Glass.** *Modern Metals,* v. 12, Dec. 1956, p. 78-80.

Procedure for making disposable glass molds by coating wax pattern with "Glascast". Completed mold will stand metal pouring temperature as high as 3300° F. (E15, W19; RM-j42)

40-E. (French.) **Deformations and Cracks.** Joseph Leonard. *Fonderie,* no. 129, Oct. 1956, p. 389-394.

Deformation is an action of the whole casting causing strains and sometimes cracks and fissures; cracks and fissures can be independent of the deformation and be affected by local phenomena; a number of forces affect each part; the last may be the determinant in exceeding tolerances. (E25, 9-22)

41-E. **Mechanized Foundry at Horwich, London Midland Region.** *Railway Gazette,* v. 105, Dec. 7, 1956, p. 669-671.

Modern foundry for the manufacture of chairs, baseplates and brakeblocks. (E general, 18-24)

42-E. **Centrifugal Casting Moves Ahead.** Nathan Janco. *Steel,* v. 139, Dec. 24, 1956, p. 72-73.

Advantages and problems of permanent mold usage; water-cooled steel molds increasingly popular. (E14, W19)

43-E. (Japanese.) **Progress in Cast Iron and Cast Steel Techniques.** Nobutaro Kayama. *Nippon Kikai Gakai,* v. 59, no. 454, Nov. 1956, p. 13-16.

Progress of cupola operations concerning air blast vs. gas analysis, specific gravity of cast material, coke grain size and the temperature of air blast. Improvement of cast iron material. Japanese cast iron standards, fluxing operations. 6 ref. (E10a; CI, 15-9)

44-E. (Book.) **The Diecasting Process.** H. K. Barton. 224 p. 1956. Macmillan Co., 60 Fifth Ave., New York 11, N. Y. $5.00.

Pressure diecasting; dies, machines, machining, finishing, production techniques; glossary of diecasting imperfections; selective bibliography. (E13)

45-E. (Book—Russian.) **Smelting and Casting of Light Alloys.** M. B. Alttman, A. A. Lebedev, A. P. Polyanskiy and M. V. Chukhrov. 491 p. 1956. Metallurgizdat, Moscow, U.S.S.R.

Fundamental technological processes of smelting and casting aluminum and magnesium alloys; information on casting in sand molds, chill molds, pressure casting, shell casting and investment casting; furnace layouts for smelting. Collection and reprocessing of tailings and methods of inspecting castings and the mechanical properties of alloys. 21 ref. (E general, C21; Al, Mg)

46-E. Zircon Inventory. B. O'M. Jones. *Castings,* v. 2, no. 9, Nov. 1956, p. 7-8. (CMA)

Zircon is described as a mineral and as a byproduct from rutile-recovery operations. Properties are noted which explain its application as a core and molding material. Zircon sand has given good results in shell molding where proper binding is used. Precautions are given for the mixing of zircon sand. (E18; NM-f45, *Zr*)

47-E. Making Ship Propellers With CO_2 Molds and Cores. Robert H. Herrmann. *Foundry,* v. 85, Feb. 1957, p. 105-109.

Methods of producing sodium silicate-bonded molds and cores hardened with CO_2 for casting bronze alloy propellers. (E19, E21; Cu-s)

48-E. How to Pour a Mold. Morris Gittleman. *Foundry,* v. 85, Feb. 1957, p. 110-111.

Specific recommendations for avoidance of defects and waste due to poor pouring practices. (E23)

49-E. Molding Practice in the Brass Foundry. Harry St. Johns. *Foundry,* v. 85, Feb. 1957, p. 112-115.

Current practices with advantages and disadvantages for brass of centrifugal casting, organic binders, shell molding, investment casting and metal mold casting. (E14, E15, E16, E12; Cu-n)

50-E. Continuous Air Blast Control Improves Cupola Operation. E. J. Parker. *Foundry,* v. 85, Feb. 1957, p. 116-119.

Experience using conventional and small experimental cupolas with continuous blast control shows increased melting rate, lower coke to iron ratio and more fluid slag. (E10a)

51-E. Closures for Coreboxes. W. Hagedorn. *Foundry,* v. 85, Feb. 1957, p. 123-125.

Describes a variety of types of closures and their advantages for wood and metal coreboxes. (E21g)

52-E. Epoxy Resin Compound Is Versatile Foundry Tool. Robert E. Williams. *Foundry,* v. 85, Feb. 1957, p. 232-234.

Epoxy resin compound containing powdered aluminum used for repairing defective castings, cementing gates to patterns and modifying patterns. (E26, E17, NM-d)

53-E. Role of Castings in a Special Supercharger. *Light Metals,* v. 20, Jan. 1957, p. 27-28.

Design and casting process for supercharger for vehicle engines. (E general, 17-1, T21b; EG-a39, 5)

54-E. Improved Foundry Composition. A. Wittmoser. *Metal Progress,* v. 71, Jan. 1957, p. 84-87.

Traces of tramp elements have been found to be responsible for many costly aberrations in foundry products. At the same time, small additions of unusual elements will control microstructure in pearlitic gray iron, reduce annealing time for malleable castings, and improve tensile properties of alloy cast steels. (E25q, 2-10; CI)

55-E. Specification: Pressure-Tight Castings. David H. Thorburn. *Precision Metal Molding,* v. 15, Jan. 1957, p. 52, 53; disc. p. 108-110.

Aluminum dies cast by impact injection. (E13; Al)

56-E. Soluble Cores: How and Where Used. Charles W. Schwartz. *Precision Metal Molding,* v. 15, Jan. 1957, p. 54, 55, 120.

Methods to solve problem of patterns with nonretractable cores, in-

cluding use of soluble wax cores. (E15, NM-d32)

57-E. Casting Forum on Technical Progress. *Steel,* v. 140, Jan. 7, 1957, p. 256-265.

Developments in the foundry and new fields of product application are outlined by 16 of the industry's leaders. A few of the advances mentioned are: gray iron use with new foundry methods, more pearlitic malleable for autos, new sand molding techniques. (E general; CI)

58-E. Soluble Cores Aid Casters. *Steel,* v. 140, Jan. 14, 1956, p. 70.

For complicated patterns involving nonretractible cores in investment casting a mixture of water soluble wax and powdered mica is suggested. (E15, W19; NM-d32)

59-E. Melting Change Brings Savings. *Steel,* v. 140, Jan. 21, 1957, p. 88.

Dry hearth melting furnace in small aluminum foundry conserves space, improves casting quality and gives greater economy in melting operations. (E10c, W19; Al)

60-E. (German.) **Technological Developments in the Foundry Industry.** Th. Klingenstein. *Metall,* v. 11, Jan. 1957, p. 29-30.

Electric furnaces for smelting of raw materials, new molding machines and techniques, and new molding materials. (E10r, E19; RM-f45)

61-E. Sulphur in Cupola Stack Gases. F. M. Shaw. *British Cast Iron Research Association, Journal of Research and Development,* v. 6, Dec. 1956, p. 444-454.

Results indicate that 40 to 70% of the coke sulphur is absorbed by the metal and slag, by far the greater proportion going into the metal. Therefore, 60 + 30% remains in stock gases. At least one third of this can be removed by a spray and baffle-type collector. (E10a; RM-j43, *S*)

62-E. Precision Casting Using Self-Setting Controlled Refractory Mold. *Canadian Machinery and Manufacturing News,* Dec. 1956, p. 640-642.

Shaw process of precision casting using a refractory mold of the split type, having good qualities of permeability, dimensional stability, resistance to thermal shock and chemical inertness at high temperature. (E15; RM-h)

63-E. Green-Sand Moulding of Large Steel Castings. Charles W. Briggs. *Foundry Trade Journal,* v. 102, Jan. 10, 1957, p. 35-43.

Type of castings produced, facing sand mixture, backing sand and molding. Difficulties and advantages of green-sand molding. (E19a; ST, 5)

64-E. "Compo" and Chamotte Moulding. R. Wright. *Foundry Trade Journal,* v. 102, Jan. 17, 1957, p. 69-73.

Main characteristics, composition, preparation and mode of application of molding materials suitable for the production of heavy steel castings. (E19; ST)

65-E. Largest Steel Casting? *Foundry Trade Journal,* v. 102, Jan. 17, 1957, p. 79-81.

The largest steel casting exhibited at Dusseldorf; casting technique. (E11; ST)

66-E. Precision Casting by the Lost Wax Process. R. G. Nicholas. *Institution of Production Engineers Journal,* v. 35, Dec. 1956, p. 727-740.

Patterns, dies, injection technique, moldmaking and quality of the precision castings. (E15)

67-E. Cast Titanium Gets Set for Commercial Use. *Iron Age,* v. 179, Feb. 7, 1957, p. 102-105. (CMA)

New developments have made commercial titanium castings feasible. Titanium castings without surface contamination are now available. Parts are cast oversized in a graphite mold, then pickled to size to remove contaminated surface. Electric arc and induction furnaces may be used for melting. Breech blocks weighing 75 lb. are cast by the Bureau of Mines. Skull-melting with copper crucibles is discussed. Battelle gets the best shell molded finish from electrically fused alumina-0.5% $MgSiF_6$. Baked sand molds promise less, while expendable molds of compressed graphite powder offer much. (E general; Ti)

68-E. Designing Gray Iron Castings. Arthur Scharf and Charles F. Walton. *Machine Design,* v. 29, Jan. 10, 1957, p. 104-122.

Casting methods and foundry facilities, design procedure. 20 ref. (E11, 17-1; CI-n)

69-E. Effects of Vibration During the Solidification of Castings. *Machinery,* v. 90, Jan. 11, 1957, p. 73-75.

Results of vibration at sonic and subsonic frequency; it was found that there is a substantial improvement in physical properties at fre-

quencies of 4000 to 5000 vibrations per min. (E25n, 1-24)

70-E. **The Effect of Cavity Proportions Upon Metal Flow.** H. K. Barton and L. C. Barton. *Machinery,* v. 90, Jan. 25, 1957, p. 201-209.

Discussion of metal flow within dies and conditions of temperature and pressure prevailing. Notes also the effects of different injection pressures on the manner in which the cavity is filled, the factors limiting injection pressures, and the nature of the turbulence produced. (E13)

71-E. **Frozen Mercury Casting Methods.** *Mechanical World and Engineering Record,* v. 137, Jan. 1957, p. 20-21.

The use of frozen mercury as a pattern agent overcomes some of the limitations of investment casting with wax or plastic patterns. Notably, the final mold may be produced with a very thin shell for better metallurgical control. (E15)

72-E. **Planning for Heat Treating in Malleable Iron Foundries.** J. T. Bryce, L. E. Emery, F. W. Jacobs, L. R. Jenkins, G. B. Mannweiler and William Zeunik. *Modern Castings,* v. 31, Feb. 1957, p. 39-54.

Selecting proper foundry practices and economical equipment. (E11, J general; CI-s)

73-E. **Soluble Wax Cores Solve the Impossible.** C. W. Schwartz. *Modern Castings,* v. 31, Feb. 1957, p. 56-58.

Investment castings by wax mica material. (E15; NM-d32)

74-E. **Charting the Way to Cupola Quality Control.** Morris Gittleman. *Modern Castings,* v. 31, Feb. 1957, p. 58-60.

Types of reports necessary for quality control. (E10a, S12)

75-E. (French.) **Practical Processes of Degassing of Light Alloys.** Claud Mascré and André Lefebvre. *Fonderie,* no. 131, Dec. 1956, p. 496-508.

Discusses and compares three processes of degassing, natural bubbling of nitrogen, bubbling of hexachlorethane, and selecting the best and most practical method of degassing of baths of light alloys such as aluminum. 16 ref. (E25s; Al)

76-E. (French.) **Cast Iron Smelting Methods in Cupola Furnaces—Industrial Induction Furnaces.** *Metallurgie et la Construction Mecanique,* Dec. 1956, p. 1011-1015.

Iron casting with the cupola furnace and the induction furnace, noting the uses and the relative advantages and disadvantages of each for various types of casting. (E10a, E10r, 1-2; CI)

77-E. (Report.) **Properties of Molding Sands Under Conditions of Gradient Heating.** N. C. Howells, R. E. Morey and H. F. Bishop. Naval Research Laboratory, U. S. Office of Technical Services, P.B. 121540, Washington 25, D.C. $.50.

A new hot strength test to determine properties of molding and core sands. (E18, 1-4)

78-E. (Report.) **The Effect of Ultrasonics on Molten Metals.** J. B. Jones, J. G. Thomas and C. F. DePrisco. 127 p. Jan. 1955. Aeroprojects Inc. for Wright Air Development Center. U. S. Office of Technical Services, P.B. 121403, Washington 25, D.C. $3.25.

Reproducible degassing of a melted aluminum alloy by ultrasonic activation. Grain refinement of the alloy with elastic vibratory energy. (E25q, E25s, 1-24; Al)

79-E. **How an Investment Casting Solved a Modern Foundry's Problem.** *Canadian Machinery and Manufacturing News,* v. 68, Jan. 1957, p. 84-87.

Seal housing and pouring operation in investment casting. (E15)

80-E. **Crucible Melting—Review of the Present Stage of Development.** D. W. Brown. *Foundry Trade Journal,* v. 102, Jan. 1957, p. 97-103.

Classification, design and use of crucible furnaces available. Melt quality, metal and crucible reactions and metal losses discussed. (E10p, 1-2)

81-E. **Design of Diecastings and Diecasting Dies. Part III.** W. M. Halliday. *Machinery Lloyd,* v. 29, Jan. 1957, p. 70-77.

Cored holes in the casting: design requirements, full-through and blind holes, minimum size of cored holes. (E13, 17-1)

82-E. **Review of Shell Moulding and CO_2 Processes.** J. L. Rice. *Metalworking Production,* v. 101, Jan. 4, 1957, p. 3-9.

Equipment needed, expense for materials, molding practices, dimensional control, advantages and shortcomings of shell molding and of CO_2 molding and core blowing processes. 21 ref. (E19c, E21)

83-E. **Plastic Speeds Patternmaking.** *Steel,* v. 140, Feb. 11, 1957, p. 108-109.

Epoxy resins simplify pattern changes, make patterns that are easily drawn and are useful in repair of pattern and core boxes. (E17; NM-d)

84-E. Ceramic Investment Shells Give High-Quality Castings. Nicholas J. Grant and Philip Manganaro. *Tool Engineer,* v. 38, Feb. 1957, p. 109-112.

New casting method for ferrous and nonferrous metals using lightweight ceramic shell molds. (E16c)

85-E. Core Making: the Neglected Back Room. O. A. Scott. *Canadian Metals,* v. 20, Feb. 1957, p. 46-48.

Eliminating core room inefficiencies; relative merits and disadvantages of CO_2 process cores. (To be continued.) (E21)

86-E. Grain Refinement of Aluminum 6% Tin. G. L. Foubert and W. C. Winegard. *Canadian Metals,* v. 20, Feb. 1957, p. 50-52.

Solidification characteristics of base alloy cast into molds at various temperatures. Addition of 1/10% titanium or a smaller portion of a mixture of titanium, zirconium and boron produced mark grain refinement. 10 ref. (E25q, 2-10; Al, *Sn*)

87-E. Pressure Diecastings of Steel. P. N. Bidula, I. I. Bobrov and K. N. Smirnova. *Engineers Digest,* v. 18, Jan. 1957, p. 23-24. Translation from *Liteinoe Proizvodstvo,* No. 7, July 1956, p. 1-4, 15.

Design of die-casting molds; mechanical properties of cast components for a range of carbon steels and comparison with those of the same type of steel in rolled form. (E13; CN)

88-E. Deoxidizing With Titanium Eliminates Pin Holes. R. D. Ahles. *Foundry,* v. 85, Mar. 1957, p. 112. (CMA)

The presence of gas holes in sand castings of Cr-Mo and Cr-Mo-V steel may be eliminated by adding elements which have an affinity for oxygen. Most lower the mechanical properties but titanium does not, nor is casting quality affected by residual titanium between 0.01 to 0.03%. Low sulphur levels are necessary. Normal heat treatment for the alloys described is 1922° F. for 12 hr. and an air quench. (E25s; AY, 5-10, *Ti*)

89-E. Investment "X" Process Makes Larger Investment Castings Possible. J. S. Turnbull. *Foundry,* v. 85, Mar. 1957, p. 117-119.

The investment "X" process is one of the techniques of producing castings by the lost-wax method. It is characterized by one-piece shell molds made by spray-coating or dip-coating a wax pattern with a permeable refractory slurry. (E15)

90-E. Production Factors Contributing to High-Quality Grey Iron. Dr. A. W. Schneble. *Foundry Trade Journal,* v. 102, Jan. 31, 1957, p. 131-134.

Layout and operations of American jobbing foundry practicing rigid quality control for molding, melting and pouring. (E11, 18-17; CI-n)

91-E. New Core Binder Showing Good Results in Aluminum Casting. *Light Metal Age,* Feb. 1957, p. 14-15.

Excellent collapsibility was obtained with the dextrose binder with no sacrifice of good green strength characteristics; component of core sand mixture is given. (E18)

92-E. Repairing Aluminum Castings With Metallic Resin Putty. Robert E. Williams. *Magazine of Applied Engineering,* v. 3, Feb. 1957, p. 116-119.

Epoxy putty is used in the foundry to repair defective castings, modify patterns and cement gates. (E26; Al, NM-d)

93-E. Now You Can Cast With Glass. *Plant Administration,* v. 17, Jan. 1957, p. 54-56.

Lost wax method uses a glass compound as the mold material, resulting in faster production, better finishes and lower costs. (E15, 1-2; NM-f42)

94-E. Door Opens to 75 Pound Aluminum Die Castings. Alfred F. Bauer. *SAE Journal,* Jan. 1957, p. 20-26.

Description of a 43-lb., 6-cylinder engine block as a one-piece die casting. The basic improvements: (1) all holes are cored, (2) relocation of camshaft to top of cylinder head and (3) drop pockets in both sides of the block (metal savers). (E13, T21b; Al)

95-E. (French.) Studies on Shrinkage and Tolerances in Casting Under Pressure. Tomonobu Kanno and Torazo Uehara. *Fonderie,* no. 132, Jan. 1957, p. 1-14.

Analyzes nature of shrinkage; gives a formula governing shrinkage in terms of expansion coefficient and temperature of the chill-mold, expansion coefficient of the metal cast, temperature of the casting at the beginning of shrinkage and ambient temperature; compares measured shrinkage with shrinkage

calculated theoretically; notes relationship between tolerances and conditions of casting. (E25n, P10c)

96-E. (French.) **Report of a Mission to the United States Concerning the Manufacture of Malleable Cast Iron.** Jean Ménat. *Fonderie,* no. 132, Jan. 1957, p. 24-28.

Materials used, types of furnaces employed, quality control and various methods of production. Some 25 foundries in addition to several universities and research establishments were visited in February and March 1956. (E general; CI-s)

97-E. (French.) **Study of the Factors Affecting the Machining of Cast Iron Used in Heating Equipment.** Claude Riotte. *Fonderie,* no. 132, Jan. 1957, p. 29-33.

Improved method of casting, working and finishing gas burners by changing the composition of the metal (for example, by lowering the phosphorous content) and by modifying the operation of the cupola furnace permitting greater ease in machinability. (E10a, E11; CI)

98-E. (French.) **Developments in Precision Casting by the Lost-Wax Process.** *Revue Générale de Mécanique,* no. 95 (new series), Dec. 1956, p. 434-436.

Investment casting; production of patterns; casting variations; methods of production; economic factors involved. (E15)

99-E. (German.) **Treatment of Melts With Mechanical Vibrations.** P. Wincierz. *VDI Zeitschrift,* v. 98, Dec. 1, 1956, p. 1881-1882.

Degassing of melts by means of mechanical vibrations which are obtained by electromagnetic oscillation. (E25s, 1-2)

100-E. **Try Shell Molds for Low Volume Casting.** Samuel Freedman. *Iron Age,* v. 179, Feb. 28, 1957, p. 84-85.

Shell mold casting of aluminum waveguides proved to be economically feasible for small lot production. (E16c; Al)

101-E. **Sealing Porosity in Metal Castings.** Marvin Schneider and Henry Siesel. *Steel,* v. 140, March 4, 1957, p. 120-125.

Sequence of operations in sealing microporosity of aluminum and magnesium sand castings by vacuum impregnation. Advantages and disadvantages of sodium silicate and polyester resins used as sealing impregnants. (E25q; NM-d35)

102-E (French.) **Considerations on a Cupola Furnace Working in a Variable Atmosphere.** Wilhelm Heinrichs. *Fonderie Belge,* no. 1, Jan. 1957, p. 1-6.

Mode of operation of cupola furnaces in general; outlines maintenance problems, nature of the slag, charge and coke employed and the possibilities of varying the composition of the metal produced in furnace currently used by Krupps at Essen, Germany. (E10a, 1-2)

103-E. (Book—German.) **Precision Investment Casting Process.** Hans Allendorf. 324 p. 1956. Fachbuchverlag, Leipzig, Germany.

A survey of world-wide literature from 1943 to 1954. Topics include construction of lost wax models, casting molds, preparation of the mold for casting, dry sand molds, cleaning of the casting, gating practice, alloys for investment casting. Extensive patent and literature bibliography. (E15)

104-E. **Hot Blast Cuts Foundry Costs.** *Steel,* v. 140, Mar. 11, 1957, p. 159-160.

Evaluation of case histories gave the following advantages for preheating cupola air blast compared to cold blast operations: coke savings of 10-15%, lower loss of iron, silicon and manganese from oxidation, more uniform chemistry, bridging eliminated, increased melting rate, lower sulphur content in iron, and iron is hotter at spout.
(E10a, 1-16; CI)

105-E. **Flame Washing of Steel Castings.** A. F. Chouinard. *Welding Journal,* v. 36, Mar. 1957, p. 219-224.

Oxy-acetylen flame washing of steel castings saves time, cuts cleaning costs, reduces handling of castings and facilitates better production control. (E24, 1-2; ST, 5)

106-E. (French.) **Die Casting—Some Factors Influencing the Rate of Production.** H. K. Barton. *Machine Moderne et Revue Mecanique,* no. 576, Mar. 1957, p. 57-61.

Among the features studied are the weight and size of the casting, method of ejection and the problem following extrusion. (E13)

107-E. (French.) **The Problem of the Utilization of Anthracite in the Metallurgical Operations of the Melting of Cast Iron.** Leon Delvaux. *Revue Uni-*

verselle des Mines, v. 13, Feb. 1957, p. 57-83.

Studies the poor resistance of anthracite to mechanical and thermal shock and suggests a solution to this problem by heat treatment previous to its utilization. 33 ref. (E10; CI, RM-j42)

108-E. (German.) **Steel Castings With Creep Strength in the Medium and Elevated Temperature Range.** H. Zeuner. *Giesserei*, v. 44, Jan. 3, 1957, p. 1-7.

Characteristic values of the material and safety factors in the calculation of wall thickness. Creep strength of the typical cast materials in the medium and elevated-temperature range. 7 ref. (Q8m; ST, 5, 17-1)

109-E. (German.) **Carbonic Acid of Limestone in the Cupola.** Hans Jungbluth and Alois Dahlmann. *Geisserei*, v. 44, Jan. 3, 1957, p. 7-13.

Different ways of eliminating the carbonic acid of the limestone. Approximation method and determination of the error originating therefrom. Special slide rules and nomograms for determining carbon dioxide and the wind volume. Conversion of the wind volume to normal conditions. 5 ref. (E10a, RM-q)

110-E. (German.) **Influence of the Mold Material and of the Alloy on the Solidification Time of Light Metal Castings.** E. Hesse. *Giesserei*, v. 44, Jan. 3, 1957, p. 13-17.

Influence of superheating, thickness of the casting, composition of the alloy, mold material, temperature and thickness of the chill mold, wash and sand mold on the time of solidification. 3 ref. (E25n, E22r)

111-E. (German.) **Contribution to the Problem of Increasing the Yield of Castings.** Werner Trommer. *Giesserei*, v. 44, Jan. 17, 1957, p. 37-45.

Importance of an increased yield as dependant on the properties of gates. Lowering the proportion of gates by directional solidification. Experiences with exothermic feeding materials to reduce the size of gates. Example for computing exothermic feeders. 28 ref. (E22p, E22s, AD-p)

112-E. (German.) **The MTM System and Its Application to a Foundry.** Ivan Edman. *Giesserei*, v. 44, Jan. 31, 1957, p. 65-75.

Principles of the methods-time-measurement system. Examples of MTM analysis. MTM as a means of producing better castings. Machine molding of brake drums. MTM for adequate coordination of the operation of the finishing plants and predetermination of work standards. Simplified determination of job times by the aid of the MTM system. (E general, A5d)

113-E. (German.) **Damage to Machines in Foundries.** Otto Neuhoff. *Giesserei*, v. 44, Jan. 31, 1957, p. 82-85.

General remarks on the causes of damage. Examples of damage caused by foreign substances, defects of the material or by faulty fabrication. Neglect of maintenance. (E general, 18-21, 18-22)

114-E. (German.) **Effects of the Treatment of Molten Cast Alloys.** Karl Löhberg. *Giesserei*, v. 44, Feb. 14, 1957, p. 89-96.

Types of crystals; aluminum-silicon alloys; lead-antimony alloys. 38 ref. (E25q; Al, Si, Pb, Sb, 5)

115-E. (German.) **Effect of Sulphur on the Saturation Degree of Cast Iron and the Practical Use of the Saturation Degree in the Operation of a Foundry.** Paul Tobias and Horst Werner Wenig. *Giesserei*, v. 44, Feb. 14, 1957, p. 97-100.

Development from the introduction of the sum (carbon plus silicon) to the use of the saturation degree in the assessment of the quality of cast iron. Tests on the effect of sulphur. 12 ref. (E25, 2-10; CI-b; *S*)

116-E. (Italian.) **Elimination of Porosity in Castings by Treatment With Inert Gases.** *Fonderie*, v. 6, Jan. 1957, p. 19-21.

Research in American foundries has shown that the passage of a stream of nitrogen of a high degree of purity through a mass of molten metal provides a quick and inexpensive method of eliminating casting defects due to porosity. Used most frequently on nonferrous alloys, but there have been recent applications to stainless steels melted in induction furnaces. (E25q)

117-E. **Core Making: the Neglected Back Room. Pt. 2.** O. A. Scott. *Canadian Metals*, v. 20, Mar. 1957, p. 62-63.

Production and benefit of shell and green sand cores and advantages of di-electric core baking. (E21)

118-E. **Sand Mould Penetration Testing. 1. A Simple Laboratory Apparatus for Estimating the Resistance of Sand Moulds to Penetration by Molten Metal.** D. H. Houseman, D.

V. Atterton and T. P. Hoar. *Castings,* Dec.-Jan. 1957, v. 3, p. 7-17.

Preparation of apparatus and technique for method employing mercury penetration and manometric measurement; comparison to green sand indentation method and estimation for degree of ramming and maximum molten metal head. (E18r, 1-3)

119-E. Sand Mould Penetration Testing. 2. A Practical Comparison of the Effectiveness of Sand Compaction by Several Foundry Moulding Techniques. D. H. Houseman. *Castings,* v. 3, Feb. 1957, p. 13-21.

Compares sand compaction by hand ramming, pneumatic ramming, jolt squeeze and sandslinger with the use of mercury penetration tests. (E18r)

120-E. Quantity Production of Tractor Castings in Elektron. W. J. Sully. *Castings,* v. 3, Dec.-Jan. 1957, p. 29-36.

Composition, mechanical and corrosion resistant properties, sand preparation, molding, coring, melting and pouring practices for tractor transmission case cast from magnesium alloy. (E11, T3n; Mg)

121-E. Fifty Years of Art Founding. A. L. Parrott. *Foundry Trade Journal,* v. 102, Mar. 7, 1957, p. 301-309.

Brief reference to development in art casting processes and outline of present methods. Highlights and notable jobs during the 50 years of author's career. (E general, A2, T9q)

122-E. Metallurgical Control of Quality in The Production of Aluminium Alloy Castings. A. V. Carless. *Institute of Metals Journal,* v. 24, Feb. 1957, p. 227-235.

Information on aluminum casting alloys in general use. Prevention of contamination, precautions for material control and analysis, control of melting practice including preparation and maintenance of melting pots, degassing, grain refinement, temperature control, casting practice including gating, feeding, mold reaction, heat treatment and inspection including crack detection test and X-ray examination. (E general, S13; Al)

123-E. Control of Quality of Magnesium-Base Alloy Castings. E. F. Emiley and P. A. Fisher. *Institute of Metals Journal,* v. 24, Feb. 1957, p. 236-254.

Comprehensive survey with emphasis on quality control includes information on alloys with zirconium or aluminum, avoidance of contamination and alloy loss, grain size control, fluxing procedures, pouring, molding, coring and running techniques and inspection methods, forging and elimination of defects, production of gravity die casting, heat treatment and suggested quality standards. 50 ref. (E general, S12; Mg, *Zr, Al*)

124-E. (German.) **New Induction Furnaces in the Light Metal Foundry.** J. P. Rohn. *Aluminium,* v. 33, Mar. 1957, p. 170-172.

Comparison of horizontal channel induction furnaces with other types of furnaces. Description of a tiltable two-chamber furnace for a piston foundry, and a low-frequency induction furnace of 3½ tons capacity. 3 ref. (E10r, 1-2; Al, Mg)

125-E. (German.) **Recent Melting Equipment for Light Metal Foundries and Its Economical Importance.** H. Heimann. *Aluminium,* v. 33, Mar. 1957, p. 173-174.

Description of a fixed and a tiltable crucible furnace for melting metal for fairly small castings and of a holding and melting furnace for pressure die casting. All furnaces are gas or oil heated. (E10, 1-2; Al)

126-E. (German.) **Development of Pressure Die Casting Machines.** F. Heinrich. *Aluminium,* v. 33, Mar. 1957, p. 175-179.

Economical and technical importance of pressure die casting. Design characteristics of cold and hot chamber machines. Semi or fully automatic control. Interchangeable unit system with main and various subsidiary units. (E13, 1-2)

127-E. (German.) **How to Calculate a Self-Computing Chart for Advance Times in the Assembly of Wax Clusters.** Eduard Haab. *Werkstatt und Betrieb,* v. 90, Feb. 1957, p. 141-144.

Description of calculation of a self-computing chart for quick determination of advance times. Example of wax cluster assembly for wax melting process in precision casting practice. (E15)

128-E. (Pamphlet—French.) **Practical Information on the Casting of Aluminum and Its Alloys.** 71 p. 1956. L'Aluminium Francais, 23, Rue Balzac, Paris 8, France.

Lists standard compositions of light alloys; properties and applications of the principal compositions used in casting; mechanical characteristics; analysis of the melting process (correct composition, absence of oxide); techniques employed; types of flux and their application; pyrometry; types of ovens and heating methods; sand casting and chill molds; defects in pieces together with appropriate remedies; heat treatment. (E general; Al)

129-E. Shrinkage Defects in K-Bar Test Castings. J. Gittus. *British Cast Iron Research Association Journal,* v. 6, Feb. 1957, p. 456-483.

Experimental study of factors believed to have influence on shrinkage defects in iron castings; mathematical analysis of simultaneous effects on surface shrinkage of maximum temperature, pouring temperature, time interval, carbon, silicon, manganese, sulphur and phosphorus content of castings and shatter index of sand; influence of melting temperature, pouring temperature, inoculation with ferrosilicon and analysis on shrinkage defects; influence of mold produced by carbon dioxide process and effects of oxygen on shrinkage defects. (E25n; CI, 9)

130-E. Speedier Production of Cylinder Liners. Harold W. Haynes. *Castings,* v. 3, Feb. 1957, p. 23-27.

Compares hand and machine ramming of cores used in casting cylinder liners. In this case hand ramming proved economical. (E22s)

131-E. Advantages of Cast Parts. W. Peppler. *Foundry Trade Journal,* v. 102, Feb. 14, 1957, p. 203-206.

Historical development of metal founding, followed by a comparison between cast and welded construction. Freedom of design in shaping castings is cited as one of the major advantages of the former. (E general, 17-1)

132-E. Automatic "Buehrer" Moulding and Pouring Plant in the Malleable-Iron Foundry of George Fischer, Limited. *Foundry Trade Journal,* v. 102, Feb. 21, 1957, p. 233-238.

Operations in a pilot plant for jobbing foundry with automatic molding and casting equipment. Details sand selection, molding and pouring practices. (E11, 18-24; CI-s)

133-E. Origin of Graphite in Cast Irons. J. E. Harris and V. Kondic. *Foundry Trade Journal,* v. 102, Feb. 28, 1957, p. 267-277.

Includes brief review of literature, reports of reheating experiments, kinetic studies and quenching tests made to determine whether graphite is formed directly from the melt or on decomposition of iron carbide during or after solidification. 15 ref. (To be continued.) (E25n; CI)

134-E. Art of Hand Ramming; or Moulds 'Through the Looking Glass'? Jaques. *Foundry Trade Journal,* v. 102, Feb. 28, 1957, p. 283-284.

Training hints for hand ramming of sand molds. Glass-sided molding box suggested for use in demonstrations. (E19)

135-E. We Owe Our Success to CO_2. Hans Jacob. *Modern Castings,* v. 31, Mar. 1957, p. 32-33.

Unusual strength of CO_2-hardened molds permits the casting of cartridges in the vertical position using a minimum of flask equipment. (E19, E17)

136-E. Graphite Spray Speeds Die Casting. *Modern Castings,* v. 31, Mar. 1957, p. 36.

Reduces surface and internal defects while increasing die life. (E13, NM-k36)

137-E. Cooling Hot Shot for Shell Backing. A. J. Hall. *Modern Castings,* v. 31, Mar. 1957, p. 58-59.

Screened and air cooled shot eliminates safety hazards and high costs which have held back the use of shot as a backing material for shell molding. (E19c)

138-E. Sprue Spreader and Sprue Bushing Design. Folke Halward. *Precision Metal Molding,* v. 15, Mar. 1957, p. 49-52.

Current American practice. Success or failure of a die-casting die may be determined by the design and cooling of sprue spreaders and bushings. (E13, 17-1)

139-E. A Shell-Core in a Sand Mold. *Precision Metal Molding,* v. 15, Mar. 1957, p. 53-54.

Cooper Alloy Corp., Hillside, N.J., has recently demonstrated that the combination of green sand mold with a shell molded core enables the casting of large parts to small tolerances without subsequent machining. (E19c; SS)

140-E. (French.) **Sulzer Precision Casting.** Walter Sulzer. *Métaux-Corro-*

sion-Industries, v. 32, Feb. 1957, p. 79-90.

Two processes applied in precision casting, the lost wax process and the "G" process; equipment, techniques, tolerances, economic considerations, machining, applications. (E15)

141-E. (German.) **Measurement and Control of Cupolas.** Walter Ruppert. *Giesserei,* v. 44, Mar. 7, 1957, p. 153-160.

Measurement of the volume and pressure of the wind; humidity of the wind; analysis of the throat gas; temperature of the melt; control of the wind volume; hot blast cupola; cupolas with the blast heated by the heat of the throat gas and by combustion of throat gas as well as of gases of other origin. (E10a)

142-E. (German.) **The Dividing Core Process.** R. Schmidt. *Giessereitechnik,* v. 3, Jan. 1957, p. 3-6.

Loss of time and money by removal of gates and heads. Separation by oxy-acetylene cutting or cutting by grinding wheel. Disadvantages of these methods. Requirements for separating core. Examples for applications. (E22s, E21)

143-E. (German.) **Contribution to the Waterglass Mold Procedure.** Siegfried Böhmer. *Giessereitechnik,* v. 3, Jan. 1957, p. 6-9.

Use of sodium waterglass as a molding material and as a core binder. Hardening by reaction of the waterglass with carbon dioxide. $Na_2SiO_3 + CO_2 = Na_2CO_3 + SiO_2$ Description of the hardening mechanism of the waterglass. Hardening with ammonia. 14 ref. (E19, E21)

144-E. (German.) **Manufacture of Wooden Patterns for Ships' Propellers.** Paul Kolawski. *Giessereitechnik,* v. 3, Jan. 1957, p. 12-13.

Various techniques in different shops, and necessity of finding the most economical one. Tracing of pitch, calculation of pitch at 10 and 5° respectively. Tracing of beam on wooden slab, cutting and assembly. (E17)

145-E. Practical pH Control for Moulding Sand. Edward C. Zuppann. *Foundry,* v. 85, Apr. 1957, p. 106-110.

Control of pH in molding sands; results to be expected; effect of pH on casting quality and defects. (E18)

146-E. Design of Gray Iron Castings. Arthur Scharf and Charles F. Walton. *Foundry,* v. 85, Apr. 1957, p. 111-115.

Consideration of design factors, of primary concern to foundrymen, which facilitate molding, coring, and pouring and minimize defects and costs. (E11, 17-1; CI-n)

147-E. Cleaning Costs Are Affected by What You Do to a Mold. Hubert Chappie. *Foundry,* v. 85, Apr. 1957, p. 116-121.

Precautions to observe in removing cope, drawing pattern, cutting gate, in application of wash, mold drying for pouring for large steel castings. (E11; ST)

148-E. Steel Foundry Shows Scrap Can Be Reduced. Robert H. Herrmann. *Foundry,* v. 85, Apr. 1957, p. 122-127.

Melting, molding, coring, pouring, cleaning and inspection equipment and procedures used in carefully managed steel foundry.
(E general; ST)

149-E. Coremaking Practices in the Brass Foundry. Harry St. John. *Foundry,* v. 85, Apr. 1957, p. 128-131.

Production and mixing methods; advantages and limitations of dielectric core baking, and the possibility of shell and carbon dioxide hardened cores. (E21; Cu-n)

150-E. Shell Cores Made by New Automatic Machine. George B. Schueler. *Foundry,* v. 85, Apr. 1957, p. 242-245.

Automatic machine using principle similar to that used for injection molding of plastics; can blow variety of good quality shell cores. (E19c, 1-2)

151-E. Line Production of Pressure Die-Castings. *Foundry Trade Journal,* v. 102, Mar. 21, 1957, p. 353-359.

Plant layout, melting, die-casting, conveying and trimming equipment and operations in an English firm. (E13, 1-2)

152-E. Investment 'X' Castings. *Materials and Methods,* v. 45, Mar. 1957, p. 124-125.

Advantages of process in which wax pattern assembly is invested with several coats and wax removed by immersion and trichloroethylene vapor. (E15)

153-E. Hardening Cement Molds With CO_2. *Modern Castings,* v. 31, Apr. 1957, p. 55-56.

Dutch technique of using CO_2 gas accelerates binding action of cement bonded cores and molds; allows removal of core boxes within a matter of minutes. (E19, E21)

154-E. Vibrating Strength Into Metals. A. H. Freedman and J. F. Wal-

lace. *Modern Castings,* v. 31, Apr. 1957, p. 64-74.

Study of the effect of 60-cycle or 20-kilocycle vibration on the structure and tensile properties when applied to solidifying melts of various aluminum and copper-base alloys; grain refinement and strength improvement occur in alloys that solidify as single-phase solid solutions; hypothesis to explain mechanism of the effect of vibration. (E25n; Al, Cu)

155-E. **Production of Titanium Shaped Castings.** R. M. Lang, G. H. Schippereit and J. G. Kura. Battelle Memorial Institute. *U.S. Office of Technical Services,* Report 60, PB 121604, Dec. 1956, 46 p. (CMA)

Melting furnaces, mold materials and casting alloys of titanium described. Since no suitable way of measuring melt temperature at pouring has been found, the superheat was measured indirectly by the power consumed after the metal becomes molten. Cast alloys thus far have strengths comparable to wrought forms, but ductility is lower. (E10, Q27a; Ti)

156-E. (German.) **Vacuum Melted Nickel for Electron Tubes.** Gerhard Pupke. *Neue Hütte,* v. 2, Jan. 1957, p. 35-39.

Melting in vacuum. Control of vacuum melting of nickel alloys with small deoxidizing additions; crucible problems; metallographic studies of grain boundary substances. (C5, 1-23; Ti; Ni)

157-E. (Italian.) **Hot Deformability of Sands Bonded With Self-Hardening Oils.** Rinaldo Cattanoe. *Fonderia,* v. 6, Feb. 1957, p. 55-57.

Lack of rigidity of sands can be largely controlled by use of oil of low thermosensitivity and additives, at least in sizes of cores studied. (E18r)

158-E. **What the Engineer Expects From a Casting.** L. B. Knoll. *Engineer and Foundryman,* v. 21, Mar. 1957, p. 56-62.

Size, shape, machinability, fettling and surface finish of castings. (E25, G17k)

159-E. **The Carbon-Dioxide Process of Mould and Core Production. (Pt. 2)** G. E. Parramore. *Foundry Trade Journal,* v. 102, Mar. 21, 1957, p. 361-365.

Method of core manufacture and indication of variety that can be produced by process; surface finish of castings, collapsibility of sand after casting, sand reclamation, carbon dioxide supply and economy made possible. (E21, E11)

160-E. **Elevated-Temperature Testing of Moulding and Core Sands and Correlation With Casting Quality.** Harry W. Dietert, V. M. Rowell and A. L. Graham. *Foundry Trade Journal,* v. 102, Mar. 28, 1957, p. 379-388.

Relationship between elevated-temperature properties of sand and failure of mold surfaces including cuts, washes, rat-tails, buckles, expansion and erosion-type scabs; description of procedure and equipment for tests of hot compression strength, hot deformation and expansion properties of mold sand. (E18r)

161-E. **Dextrose Binder Speeds Core Production.** C. F. Lourich. *Iron Age,* v. 179, Apr. 4, 1957, p. 104-105.

Cores made with Dexocor baked in 40 to 50% less time are harder and stand up better than cores made with conventional core binders. (E21)

162-E. **Titanium-CO_2 Process for Cast Iron.** J. V. Dawson, B. B. Bach and L. W. L. Smith. *Metal Progress,* v. 71, no. 4, Apr. 1957, p. 174, 176. (Digest from *Journal of Research and Development,* British Cast Iron Research Association, v. 6, June 1956, p. 249-258.) (CMA)

Adding titanium to gray cast iron refines the graphite structure; bubbling a dry, inert gas such as CO_2 or argon through the iron also enhances refining by lowering the hydrogen content. Up to 0.25% titanium was added. (E25q; CI-n, Ti, AD-p)

163-E. **Research on Shell Molding.** Massachusetts Institute of Technology (Frankford Arsenal). *U.S. Office of Technical Services,* PB 121031, May 1953, 54 p. $1.50.

Economy measures were sought through a study of means for making suitable shells with a minimum of phenolic resin. Recommendations for conservation are based on such practices as increased scientific control of variables such as grain size and distribution of sand and resin, particle packing and surface preparation of sand. Knowledge of the binding mechanism was gained through evaluation of various brands of resins by strength tests on shell specimens. (E19c)

164-E. (Czech.) **Experiments on Oxygen Enrichment of the Blast for Cu-**

polas. M. Vilgus and B. Otohal. *Henry Brutcher Translation* no. 3889, 5 p. (From *Slévarenstvi*, v. 2, no. 10, 1956, p. 292-296.) Henry Brutcher, Altadena, Calif.

Previously abstracted from original. See item 59-E, 1955. (E10)

165-E. (French.) **Preheating of Casting Ladles.** *Journal d'Informations Techniques des Industries de la Fonderie*, no. 84, Feb. 1957, p. 4-6.

Preheating reduces caloric loss to a significant degree; moreover, in many cases, a sufficiently high casting temperature lowers the incidence of rejects. It is claimed that it is better to heat the ladles rather than the ingots. Calculation of production costs in relation to cost of fuel used and heat conserved by each technique. (E10, E25n)

166-E. (French.) **Benefit Derived From the Preheating of Molds in Casting Under Pressure.** *Journal d'Informations Techniques des Industries de la Fonderie*, no. 84, Feb. 1957, p. 7-8.

Preheating avoids equipment damage by suppressing over-violent heat shock and reduces unfavorable results such as cold shuts; factors determining the heat necessary for the casting of various metals; information of cracks; methods of preheating. (E19)

167-E. (French.) **Die Casting—Some Factors Influencing the Rate of Production.** H. K. Barton. *Machine Moderne et Revue Mecanique*, no. 577, Apr. 1957, p. 61-66.

Further features involved in the casting process; analysis and description. (E13, 17-2)

168-E. (German.) **Set-Up Time Per Piece in Hand Molding, Core Making and Fettling of Castings.** Friedrick Lamm. *Giesserei*, v. 44, no. 8, Apr. 11, 1957, p. 202-205.

Significance of the set-up time per piece in the calculation of prices; possibilities of improving upon the set-up time; investigation of the set-up time according to work processes. (E19, E21, A5)

169-E. (German.) **Volume Change of Metals on Solidification.** R. Domanowski. *Giesserei-Praxis*, v. 75, Feb. 25, 1957, p. 77-80; Mar. 10, 1957, p. 100-104.

Methods of solidification, causes of volume changes and preventive measures for obtaining minimum shrinkage. 4 ref. (E25n, P10d)

170-E. (German.) **Shrinkage and Contraction in Steel Castings.** Sirius. *Giesserei-Praxis*, v. 75, Mar. 25, 1957, p. 113-115.

Prevention of internal shrinkage through the use of risers. (E22q, P10d)

171-E. (German.) **Casting of Highly Conductive Copper.** Ernst Brunhuber. *Giesserei-Praxis*, v. 75, Mar. 25, 1957, p. 115-117.

Importance of deoxidizers; melting furnaces; methods of casting. 4 ref. (E10, E11; Cu, AD-r)

172-E. (German.) **Influence of the Casting Temperature and of Alloying Metals Upon the Structure of the Casting.** F. Lihl and T. Sagoschen. *Metall*, v. 11, Mar. 1957, p. 179-189.

A fine crystalline structure in aluminum alloys can be obtained by: (1) choice of a casting temperature slightly above melting point; (2) addition of alloying metals which reduce the grain size, and (3) suitable choice of solidification conditions and mechanical treatment of the melt in the region of the solidification temperature. 32 ref. (E25n, M27; Al)

173-E. (Book—Finnish.) **CO_2 Process in the Foundry.** Paauo Asanti and Aarne Raikka. Finnish State Institute for Technical Research. (Metallurgical Report Series 2-1 Tiedotus, Sarjall-Metalli.1.) 1956, 1116 p.

Investigation of the CO_2 process with a description of the characteristics of sands for molds and cores. Waterglass is found to impart good properties to the sand mix. For high-alloy steel castings, the use of a blackwash containing zirconia and chromium ore powder is recommended. 35 ref. (E18p)

174-E. (Book—German.) **Modern Foundries.** A. Schulenburg. 424 p. 1955. Fachverlag Schiele and Schön Bopp Strasse 10, Berlin SW 29, Germany. DM 28.

Technical and organizational prerequisites for modern foundry operation. Topics discussed are plant and efficient area utilization; technical and mechanical facilities; modern molding and pouring methods; plant organization and working methods. (E general, W10)

175-E. (Book—German.) **Calculations and Tables for Foundry Personnel.** Gerhart Tschorn. 214 p. 1957. VEB Wilhelm Knapp Verlag, Mühlweg 19, Halle (Saale), C2, Germany. DM 16.

Calculation of strength of materials, weight of castings, pyrometry and teeming; operating characteristics of foundry equipment; metallographic and metallurgical calculations. (E general)

176-E. Pressure Die-Casting: Rapid Production of Carburetor Bodies to Precise Limits. *Automobile Engineer,* v. 47, Mar. 1957, p. 113-119.

Operations at the Stanmore Engineering Co., Ltd., Stanmore, Middlesex, England. (E13)

177-E. Needed: Molds for Casting Titanium. *Chemical and Engineering News,* v. 35, May 20, 1957, p. 84. (CMA)

Battelle metallurgists report that the commercial casting of titanium is not now feasible, but a casting market for 10% of the sponge production is predicted by 1960. What is needed is a cheap, inert mold material. Graphite is expensive and mold life may be low, but maximum depth of contamination is 0.01 in.; penetration may be up to 0.06 in. with refractories of alumina, zirconium dioxide and silica. Companies which have expressed interest in experimental developments are noted. (E11, W19g; Ti)

178-E. Breakdown of CO_2 Cores. F. LeServe and H. D. Segrove. *Foundry Trade Journal,* v. 102, Apr. 4, 1957, p. 409-411.

Experimental work on the effect of calcium carbonate additions to silicate and sand mixtures for producing cores by carbon dioxide process; demonstrates that 3% calcium carbonate increases ease of breakdown of cores heated to temperatures between 800 and 1000° C. (E21)

179-E. Hallside Foundry. *Foundry Trade Journal,* v. 102, Apr. 4, 1957, p. 413-416.

General description of plant layout and techniques employed in molding, casting, stripping and cleaning large castings of low-carbon steel at foundry associated with Steel Co. of Scotland, Ltd. (E11; CN, 5-10, 18-17)

180-E. Design of Diecastings and Diecasting Dies. Pt. 4. W. N. Halliday. *Machinery Lloyd,* v. 29, Mar. 16, 1957, p. 69-74.

Examples of cored holes in diecast components and illustrations of some errors and inappropriate forms commonly specified; coring deep small holes and application of movable cores. (To be continued.) (E13, 71-1)

181-E. Pressure Die-Castings for Anodizing. W. H. Hall. *Metal Industry,* v. 90, Mar. 29, 1957, p. 249.

Aluminum alloy requirements for pressure die casting and for production of high-quality anodic finish; conflict between these aims and problem in production of sound bright castings. (E13, L19; Al)

182-E. Soluble Wax Cores. C. W. Schwartz. *Modern Castings,* v. 31, Feb. 1957, p. 56-57.

Material for making soluble wax cores consists of a mixture of polyethylene glycol and 160-mesh powdered mica. Problem of shrink voids in cores is overcome by allowing injected pattern wax to enter through small holes drilled in the core to the shrink voids. (E19g; NM-d 32)

183-E. Charting the Way to Cupola Quality Control. Morris Gittleman. *Modern Castings,* v. 31, Feb. 1957, p. 58-60.

A record-keeping program for cupola control as applied at Pacific Cast Iron & Pipe Fitting Co. to aid gray iron quality control. Forms may be modified to fit other foundry operations. (E10a, S12g; CI)

184-E. Quality and Cost of Magnesium Sand Castings. Felix M. Giordano. *Product Engineering,* v. 28, Mar. 1957, p. 165-166.

How to avoid common design factors which cause unsoundness or increase the cost of magnesium sand castings. (E11, 17-1, 17-3; Mg)

185-E. Improve Castings on a Production Basis. Robert Bargert. *Production,* v. 39, Apr. 1957, p. 80-83.

Problem of determining adequate time and pressure to detect "leakers" can be solved by eliminating porosity; discussion on oxide scaling, design fundamentals, heat control and pump system. (E25q, 17-1)

186-E. Interim Report on Studies of the Effects of Geometry on the Properties of Gun-Metal (88-8-4) Castings. W. H. Johnson. Naval Research Laboratory. *U.S. Office of Technical Services,* PB 121769, Jan. 1957, 8 p. $.50.

Study of the tin-bronze alloy gunmetal aimed at establishing the relationship between test-bar properties and properties which may be expected from castings of different geometries and thicknesses; data of interest to the foundryman and de-

sign engineer in indicating preferable foundry processing procedures. (E11, Q general, 1-10; Cu, *Sn*)

187-E. (German.) **Casting Rejects Due to Shrinkage Cavities.** Hans Reiniger. *Giesserei Praxis,* v. 75, Apr. 10, 1957, p. 129-133.

Causes, types and countermeasures for shrinkage cavities. (E25n, 9)

188-E. (Swedish.) **Foundry Mechanization in the United States.** Olof Carlsson. *Gjuteriet,* v. 47, Jan. 1957, p. 1-5.

Various examples of foundry mechanization in the United States principally for the molding department. Importance of a schedule for the different steps of mechanization is pointed out. (E general, 18-24)

189-E. (Swedish.) **How to Design Light Metal Castings.** G. Lindh and R. Elg. *Gjuteriet,* v. 47, Feb. 1957, p. 19-23.

Design of gear covers of light metal; sand casting, gravity and pressure die casting. (E11, E13, 17-1; Al)

190-E. Line Production of Die Castings. *Engineer,* v. 203, Mar. 22, 1957, p. 453-454.

Particulars of an interesting flowline system for the manufacture of die castings. Preliminary investigations and how the basic plans were carried out in the works. (E13, 1-2)

191-E. Properties of Silica With Reference to Foundry Sands. J. J. Marais. *Engineer and Foundryman,* v. 21, Feb. 1957, p. 50-57.

Comparison of silica with other molding sands. (E18r)

192-E. Quality Castings in Light Alloy. P. A. Broadbent. *Inspection Engineer,* v. 20, Nov-Dec. 1956, p. 122-129.

Advantages and disadvantages of casting processes; heat treatment of castings.
(E general, J general; Al, Mg)

193-E. Cost-Cutting With Grinding Wheels: Pt. 1. Snagging Wheel Speed Control. John A. Mueller. *Modern Castings,* v. 31, Feb. 1957, p. 62-64.

Control of surface speed is first step in planning snagging operations. Relation between wheel speed, wheel work pressure, power consumption and wheel efficiency. (E24j)

194-E. Developments in the Casting of Steel Tools for Plastic Moulding. *Plastics,* v. 22, Mar. 1957, p. 85-88.

Shaw casting process, in which ethyl silical is used as a bonding agent for silica at casting temperature of 1600° C. (E16; TS)

195-E. (Czech.) **Production of Pyroferal Castings.** Zdenek Eminger. *Materialovy Sbornik,* 1956, p. 117-140.

Melting, choice of raw materials to be charged, casting technique, shrinkage, sands, molding methods and system of runners and risers. Frequently occurring defects and their cause. Best production methods and advantageous feeding systems for certain kinds of castings. (E11; SGA-h, Fe, Al, 9-18)

196-E. (French.) **Modernization and Partial Conversion of a Foundry.** *Usines d'aujourd'hui,* no. 37, p. 65-70.

Plant of Ets. Bouchayer et Viallet at Grenoble. Efficiency has increased as a result of reducing diversity of products, careful maintenance planning, better handling of space. Problem of quality control largely solved by change to G. S. (spheroidal graphite) type castings and adoption of newly developed Corning precision molding process. (E11, E16c, 18; CI)

197-E. (Italian.) **Cost and Technical Comparison of the Various Methods of Producing Commercial Cast Iron.** Hans Malzacher. *Fonderia,* v. 6, April 1957, p. 143-145.

Hot blast cupola, low frequency and industrial frequency arc furnaces compared. (E10, 1-2, 17-3)

198-E. How to Pour a Mould. *Australasian Manufacture,* v. 42, Apr. 6, 1957, p. 43-45.

Specific recommendations every foundryman can follow to insure smooth function of the pouring operations. (E23)

199-E. Cooperation Between Designer and Foundryman. M. M. Hallett. *British Cast Iron Research Assoc. Journal of Research and Development,* v. 6, Apr. 1957, p. 530-545.

Certain characteristic defects of gray iron castings and illustrations of successful improvements effected in design. (E general, 17-1; CN-n, 9)

200-E. Hot Blast Package Reduces Melting Costs. *Canadian Metals,* v. 20, Apr. 1957, p. 46-48.

Advantages of use of cupola blast heater at Canadian iron foundry. (E10a, 1-2)

201-E. Steelfoundry Moulding Materials. J. M. Middleton. *Foundry*

Trade Journal, v. 102, Apr. 18, 1957, p. 469-475.

Surveys present trend in molding and coremaking methods and materials. Section on molding discusses silica, zircon, olivine and other substitutes for silica. Sand reclamation, bentonites, other bonding materials and pH control. Linseed oil, resin and other core-binders and additives discussed in section on coremaking. 20 ref.
(E19, E21; NM-f 45, ST)

202-E. Foundry Industry of Finland. Eugen Autere. *Foundry Trade Journal,* v. 102, Apr. 25, 1957, p. 501-508.

Over-all survey of the foundry industry in Finland with detailed notes on a few of the larger foundries. (E general)

203-E. Control of Aluminum-Alloy Melting Practice. *Foundry Trade Journal,* v. 102, Apr. 25, 1957, p. 509-512.

Control of contamination from melting crucible, gas absorption, time at pouring temperature, temperature range and special precautions for aluminum-silicon and aluminum-magnesium alloys.
(E10p; Al, *Si, Mg*)

204-E. Guidance in Casting Brass and Bronze Test-Bars. *Foundry Trade Journal,* v. 102, Apr. 25, 1957, p. 513-514.

Committee report recommending techniques for casting test bars of aluminum bronzes and high-tensile brasses. Problems in obtaining test bars of copper-tin alloys.
(E11, 1-10; Cu-n, Cu-s)

205-E. Viscosity and Mould Filling Properties. *Light Metals,* v. 20, Apr. 1957, p. 131-133.

Reviews internal variables and external influences on mold filling properties of aluminum alloys. Apparatus and procedure for determination of molten metal viscosity; data on flow time of two aluminum alloys and compares flow time with cast spiral characteristics. 6 ref.
(E25p, P10f; Al)

206-E. New Applications for Shell Casting. H. G. Sieggreen. *Machine Design,* v. 29, May 2, 1957, p. 112-114.

Advantages of shell moldings, examples and designs. (E16c)

207-E. Relation of Runner Layout to Ease of Trimming. H. K. Barton and L. C. Barton. *Machinery,* v. 90, Apr. 26, 1957, p. 945-955.

Emphasizes specific requirements of subsequent trimming operations in connection with design and layout of runners and gates for feeding mold cavity. (E22p, E24h)

208-E. Automatic Processes in Die-Casting Production. H. K. Barton. *Metal Industry,* v. 90, May 10, 1957, p. 391-395; disc. 399.

Automation applied to metal handling, machine operation, trimming and fettling, machining and polishing. Extent of automation is dependent upon quantities of die castings to be produced to a single design and by a single plant.
(E13, 1-2, 18-24)

209-E. Improvement of Sand Testing Techniques for Shell Mold and Core Sands. P. J. Ahearn, F. C. Quigley and J. F. Wallace. Watertown Arsenal. *U.S. Office of Technical Services,* PB 121412, July 1956, 35 p. $1.

A new design was developed for tensile test briquettes which minimizes the concentration of stresses at the critical testing zone. A higher apparent tensile strength was demonstrated for all sands tested and reproducibility was improved for rammed resin and oil-bonded sands. (E18r)

210-E. Operating Hot-Blast Cupolas. R. Drechsler. *Henry Brutcher Translation* No. 3935, 3 p. (From *Giessereitechnik,* v. 2, no. 1, 1956, p. 4-6.) Henry Brutcher, Altadena, Calif.

Conversion of two cold blast cupolas to operation on hot blast. Description of plant; blast flow and electric wiring in hot blast cupolas.
(E10a, 1-2)

211-E. (French.) **Gravity Casting in Chill Molds. Generalities. Applications to Light Alloys.** Maurice Billing. *Fonderie,* no. 135, Apr. 1957, p. 161-169.

Field of application of this process; comparison with sand casting; melting; equipment; techniques; methods of avoiding typical flaws.
(E12; EG-a39)

212-E. (French.) **Present Status of Die Casting Evaluated—Progress Since 1952.** Achille Brizon. *Fonderie,* no. 136, May 1957, p. 197-208.

Impact of American techniques closely studied in 1952. Present practice of die casting in France from the point of view of raw materials, equipment, machinery and techniques. (E13)

213-E. (French.) **Improvement in the Process of Cupola Use: a New Cupola With Superheating for the Production of High-Quality Cast Iron.** Jean Guillamon. *Fonderie Belge,* no. 2, Feb. 1957, p. 15-21.

New technique of furnace operation capable of furnishing cast iron of quasi-constant chemical composition at very high temperatures without an increase in melting costs. Analysis of results. 5 ref. (E10a; CI)

214-E. (French.) **Avoidance of Overweight Ingots in Iron Founding.** *Journal d'Informations Techniques des Industries de la Fonderie,* no. 83, Dec. 1956-Jan. 1957, p. 1-4.

Outlines method for exact calculation of the weight of iron cast resulting in considerable economies. (E11, A5d; CI)

215-E. (French.) **Notes on a Manufacturing Practice.** *Journal d'Informations Techniques des Industries de la Fonderie,* no. 83, Dec. 1956-Jan. 1957, p. 7-8.

Description of chill mold casting of copper plates of 99.7% copper content. (E12; Cu)

216-E. (French.) **Concerning Explosions in the Cupola Furnace.** *Journal d'Informations Techniques des Industries de la Fonderie,* no. 85, Mar. 1957, p. 10-11.

Enumeration of explosive risks and analysis of probable causes. Outlines specific precautions to be taken in furnace operation. (E10a, A7p)

217-E. (German.) **Investigation on the Refractory Lining, the Blowing Practice and the Size of Hot Blast Cupolas Used in Steel Plants.** Wilhelm Patterson and Albert F. Oberhofer. *Giesserei,* v. 44, Apr. 25, 1957, p. 227-237.

Description of the furnace; materials charged and analyses of iron and slag; cross-section of the cupola in the tuyere plane; heat balance of the plant; temperature measurement and the temperature of iron and slag; combustion ratios. (E10a, W18d, 1-2; ST)

218-E. Quicker Dies, Lower Costs With Shaw Process. *American Machinist,* v. 101, Apr. 8, 1957, p. 126-128.

New ceramic mold technique in which a flexible mold made from pattern is stripped off and hardened by heating. Method is as accurate as lost-wax process. (E16, W19q, 1-2)

219-E. Sound Investment Castings. *Australasian Manufacturer,* v. 41, Mar. 23, 1957, p. 32-38.

Remedies for dip coat spalling, buckling, gas defects, dirt inclusions, slag inclusions, mold cracks in investment casting. (E15, 9)

220-E. Casting Properties of Some Nickel-Base and Other Nickel-Containing Alloys. D. R. Wood and J. F. Gregg. *British Foundryman,* v. 50, Jan. 1957, p. 2-14.

Spiral pattern testing procedure used to measure the casting properties of Inconel with small variations in composition and the castability of a wide range of nickel-base and other nickel-containing alloys. Investigation shows fluidity as conventionally measured to be dependent on degree of superheat, but casting quality as measured by spiral cast is related to composition of melt as well as degree of superheat. 6 ref. (E25p; Ni)

221-E. Development of Internal Stresses Leading to the Cracking of Grey Iron Castings. H. T. Angus and W. G. Tonks. *British Foundryman,* v. 50, Jan. 1957, p. 14-22.

Principles involved in development of casting stresses during solidification and cooling; effect of metal composition, microstructure, methods of running, time and method of knock-out and other variables on the development of casting stresses; examples from thin-sectioned boilers to heavy machinery castings and causes of failure. 12 ref. (E25n, Q25; CI-n, 9-22)

222-E. Planning and Operating of a Mechanized Core Shop for the Blowing of Small and Medium Size Cores. J. Hill. *British Foundryman,* v. 50, Jan. 1957, p. 23-29.

Factors in the layout and operation of a core shop using three different types of core blowing machines. (E21g, 1-2)

223-E. Design and Operation of Two Water-Cooled Cupolas. D. W. Berridge and J. R. Hawley. *British Foundryman,* v. 50, Feb. 1957, p. 53-61.

Details of the design and operation of basic-lined and acid-lined water cooled cupolas; information on fluxing, melting and tapping procedures; problems and set-backs in the water cooling systems; comparison of performance and advantages gained by cooling. (E10a, 1-2)

224-E. Flowability of Foundry Sands. A. Tipper. *British Foundryman,* v. 50, Feb. 1957, p. 62-65.

Literature review of property of foundry sand generally called flowability or ramability; covers definition, test method and influence of clay, sand, grain shape and moisture content on flowability. 14 ref. (E18r)

225-E. Services for the Moulder. H. P. Millar. *British Foundryman,* v. 50, Feb. 1957, p. 66-75.

For efficient use of a molder's skill he must have raw materials, equipment, housing and other services. (E19, A5)

226-E. Some Aspects of Shell Moulding Theory. A. Braybrook and B. H. C. Waters. *British Foundryman,* v. 50, Feb. 1957, p. 77-94.

Consideration of theoretical aspects of shell molding with reference to factors affecting hot and cold strength hardness, permeability, use of precoated sand, gas content of shell mold, surface finish of casting, shell closing, running and feeding and pattern plate for shell molding. 37 ref. (E16c)

227-E. Metal Losses in Crucible Melting Practice. R. S. Jackson and D. W. Brown. *British Foundryman,* v. 50, Mar. 1957, p. 103-109.

Measurements to assess the effect metal losses made on a number of commonly used copper-base alloys melted in tilting and lift-out oil-fired crucible furnaces; practices included melting under charcoal or flux, contact with oxidizing or reducing furnace atmospheres. (E10p, 1-2)

228-E. Future Developments in the Founding of Metals. Frank Hudson. *British Foundryman,* v. 50, Mar. 1957, p. 143-154.

The foundry industry of the future requires closer study of the effect of such variables as casting design, casting properties, fuels and furnaces for melting. 10 ref. (E general)

229-E. Mould Drying. *British Foundryman,* v. 50, Apr. 1957, p. 169-183.

Factors involved in mold drying —moisture content, permeability and types of sand, temperature, time of drying, methods of heating and striking back after drying; results of laboratory and industrial tests; four methods based on electrical resistance for following moisture content. 4 ref. (E19)

230-E. Injection Processes in American Foundries. George P. Dahm and Chester E. Bieniosek. *British Foundryman,* v. 50, Apr. 1957, p. 190-196.

Injection processes depend on entraining finely divided solid material in a gas stream which then delivers the solid materials below the surface of metal bath. This technique has become a production tool for desulphurization, carburization and partial or full nodulization of cast iron. Injection of calcium carbide for desulphurization, graphite for carburization and nodulization brought about by magnesium and cerium additions enable foundries to diversify without need for additional melting units. (E25; CI, AD)

231-E. Surface Sinking Defects in Grey Iron Light Castings. I. C. H. Hughes. *British Foundryman,* v. 50, Apr. 1957, p. 202-210.

Investigation aimed at determining cause of sinking defects in thin sections of iron castings. Effect of carbon, silicon, manganese and phosphorus, of pouring temperature and of inoculation on the occurrence of sinking defects in test plate castings 3/16 to 5/16 in. thick. 6 ref. (E25q, 2-10, CI-n, 9)

232-E. Brass Foundry. Pt. 22. Cleaning Room Practice. Harry St. John. *Foundry,* v. 85, May 1957, p. 168-170.

Removal of cores, gates, sprues, cleaning by sand or shot blasting, sorting, repair procedures and inspection in brass foundry. **(E24h, L10c, S general; Cu-n)**

233-E. Which Core Process? Warner B. Bishop. *Foundry,* v. 85, May 1957, p. 180-183.

Conventional shell, gas setting and air setting core processes, advantages and weaknesses. (E21)

234-E. Casting Quality Enhanced by Good Core Properties. R. W. Carpenter. *Foundry,* v. 85, May 1957, p. 352-356.

Use of dextrose binder and ammonium sulphate; catalyst provides cores that are fast baking and have little tendency to crack. Binder gives fast clean mulling and no stripping problem when release agent is used. (E18n, E21)

235-E. Clyde Alloy Steel Company, Ltd. *Foundry Trade Journal,* v. 102, May 9, 1957, p. 571-577.

Sand handling, molding, coring, cleaning, trimming, blasting, testing and other practices in a jobbing foundry in Scotland which makes a wide variety of steel castings, weighing from 1 lb. to 18 tons, from carbon and high-alloy steels. (E general; CN, AY, SS)

236-E. Metallurgical Principles of the Control of Quality of Non-Ferrous Castings. R. W. Ruddle and A. Cibula. *Institute of Metals Journal,* v. 85, Mar. 1957, p. 265-292.

Relation between defects in castings and the flow of liquid metal through gating system and into mold cavity. Rate and mechanisms in freezing metals and alloys; control of gas content, grain refinement, number of nonmetallic inclusions and the design of test bars. 122 ref. (E25n; EG-a, 9-18, 9-19)

237-E. Control of Quality in the Production of Nickel Alloy Sand Castings. D. R. Wood and J. F. Gregg. *Institute of Metals Journal,* v. 85, Mar. 1957, p. 319-329.

Effect on mechanical properties of nickel alloys of variations in amounts of carbon, silicon, copper, magnesium, sulphur and lead and factors affecting welding properties and castability; choice of melting furnace, furnace lining, raw materials for melting, techniques of alloying, degassing, deoxidation and sulphur control; precautions in molding and casting. 8 ref. (E11, Q general, 2-10; Ni)

238-E. Control of Quality of Pressure Die-Castings. H. J. Sharp. *Institute of Metals Journal,* v. 85, Mar. 1957, p. 330-338.

Measures to be taken for production of high-quality pressure die castings include selection of suitable machines and alloys for pressure die casting, detection and elimination of defects, control of metal quality, casting and die design, maintenance of suitable heat balance in die cavity, control of metal flow into die, control of injection pressure. (E13)

239-E. New Pointers on CO_2 Molding. *Iron Age,* v. 179, Apr. 25, 1957, p. 99-101.

Report on a Japanese study gives data on effect of sodium silicate viscosity, gas treatment time, gas pressure, added organic binders on mold permeability and compressive strength. (E19)

240-E. Liquid Shrinkage. Problems of Compensation in Steel Castings. E. Longden. *Iron and Steel,* v. 30, Apr. 1957, p. 147-148.

Evaluates gating and feeding methods and casting design in connection with casting defects. Description of several insulation and exothermic reaction compounds used to prolong freezing period of feederhead metal. (To be continued.) (E22p, E22s; ST)

241-E. Line Production of Die Castings. H. K. Barton. *Machinery,* v. 90, Mar. 29, 1957, p. 707-719.

Plant layout, induction heating furnaces, holding furnaces, die casting machines, work conveyor system, scrap disposal equipment, trimming presses, ingot casting and metallurgical control and finishing operations in modern English plant making zinc die castings. (E13, 1-2; Zn)

242-E. Precision Investment Casting by the Mercast Process. *Machinery,* v. 90, Apr. 5, 1957, p. 736-742.

Typical British castings made with frozen mercury patterns, including aluminum wave guide components, copper alloy and steel castings; redesign of castings for full advantage of process use. (E15; Al, Cu, ST)

243-E. Precision Investment Casting by the Mercast Process. *Machinery,* v. 90, Apr. 12, 1957, p. 813-821.

Molding and casting methods, pattern die design and use in producing castings from frozen mercury pattern and ceramic mold in British plant. (E15, 1-2)

244-E. Line Production of Pressure Die Castings. *Mechanical World,* v. 141, May 1957, p. 223-225.

Modern metal feeding, casting and conveying methods applied to maximize economy and to exercise control of product quality. (E13, 18-24)

245-E. How to Mix Molding Sand Without Water. R. G. Megaw and K. A. Miericke. *Modern Castings,* v. 31, May 1957, p. 94-95.

Waterless sand mix bonded with oil and bentone produced variety of high-quality castings from aluminum, bronze, brass, nickel and stainless steel. (E18p)

246-E. Trimming Zinc Die Castings With Complete Safety. Roy Melinder.

Modern Machine Shop, v. 30, June 1957, p. 114-115.

Using multiple-cavity dies, zinc diecast parts for miniature electric trains are safely trimmed in a 15-ton punch press with "dead" motor which eliminates loading hazards. (E24h; Zn, 5-11)

247-E. **Line Production of Pressure Die Castings.** *Process Control and Automation,* v. 4, May 1957, p. 159-161.

Advantages of automation—better quality, efficient tooling and lower cost. (E13, 18-24)

248-E. **Shell Molding Makes Better Cast Crankshafts With Lower Foundry and Machining Costs.** H. N. Bogart. *SAE Journal,* v. 65, May 1957, p. 26-27.

Advantages of shell molding crankshafts. (E16c, T21b; CI)

249-E. **Improved Metals for Castings.** *Steel,* June 3, 1957, p. 98-102.

Description of some advances revealed at the First Engineered Castings Show of the American Foundrymen's Society in Cincinnati such as calcium additions to improve gray iron, new steel which resists brittle fracture, a cupronickel casting alloy for corrosive marine service. (E general)

250-E. **Proper Gating for Uniform Distribution of Mold Metal.** Domenic Coccione. *Western Metals,* v. 15, May 1957, p. 60-61.

Gating methods and gating area for steel high-pressure cylinder as well as for Meehanite. (E22p; ST, CI)

251-E. (German.) **Studies on the Susceptibility of Magnesium Die Castings to Shrinking and Cracking.** K. E. Mann. *Giesserei,* v. 44, May 23, 1957, p. 301-305.

Causes of hot tears and stress cracks and their prevention; trials with different alloy contents. (E13; Mg, 9-22)

252-E. (German.) **Raw Materials for the Foundry at the GIFA.** Franz Roll. *Giesserei,* v. 44, May 23, 1957, p. 308-314.

Melting materials; pig iron, ferroalloys; molding sands and additions; quartz sands, bentonites, auxiliary mold and core materials; heat exchangers; electrodes; refractories. (E general; CI-a, Fe, AD-n, NM-f45)

253-E. (German.) **Importance of High-Frequency Drying and Baking in the Foundry.** Emil Walther. *Giesserei,* v. 44, May 23, 1957, p. 316-318.

Power required and cost of drying; operation of high-frequency drying ovens. (E21h, 1-2)

254-E. (Russian.) **Selecting the Composition of Cast Iron and Study of Rational Technology for Casting Grinding Media.** O. A. Nesvizhskii. *Liteinoe Proizvodsvo,* no. 3, Mar. 1957, p. 1-4.

Discussion on grinding media, such as balls, rods and ovoids, widely used in mining, construction and chemical industries. Cast iron containing chromium, nickel and molybdenum as well as ordinary white cast iron may be used. The media may be cast in sand molds, chill molds with the use of vibration, or in a centrifugal machine. (E11, T28, 17-7; CI-p, CI-q)

255-E. (Russian.) **Casting System Using Restricted Gates.** B. V. Rabinovich. *Liteinoe Proizvodsvo,* no. 3, Mar. 1957, p. 4-9.

Slit-like gates for controlling the flow of metal are described. Depending on the problem created by the demand of the work, four types of restricted gates are used—single or double gates on one side of the runner, and single or double gates on both sides of the runner. Their use diminishes the entry of gases into the mold, prevents contamination by slag and provides an even flow of metal. (E22p)

256-E. (Russian.) **Cooling of Cast Plates in Sand Molds.** O. Y. Kotsyubinskii. *Liteinoe Proizvodsvo,* no. 3, Mar. 1957, p. 9-14.

Process of cooling of cast iron plates of unlimited extension is examined in all its phases. Theoretical discussion supported by extensive calculations. (E19; CI)

257-E. (Russian.) **Formation of Surface Gaseous Blow-Holes on Heats of Cast Iron Containing Magnesium.** A. D. Ushakov. *Liteinoe Proizvodsvo,* no. 3, Mar. 1957, p. 19-20.

With the help of radiographs obtained by the introduction of radioactive sulphur into the cast iron before alloying with magnesium it was established that the sulphur was unevenly distributed along highest layer of the casting. The inclusions are of spherical shape containing sulphur compounds. To avoid their formation it is necessary to superheat the molten metal and hold the heat until after the

treatment with magnesium additives. (E25s; CI, Mg, AD-p, 9-18)

258-E. (Russian.) **Pouring of Cast Iron Cutters With Tungsten Carbide Inserts.** L. Z. Malisov. *Stanki i Instrument,* v. 28, Mar. 1957, p. 38-39.

Cutters are cast into usual sand molds into which the inserts are already placed. The insert is joined to the cast iron body by the casting process. Casting is done in such manner that bonding is assured by the proper pre-heating of the inserts. (E11; CI, W, 6-19)

259-E. **Shell Moulding and CO_2 Processes.** *Australasian Manufacturer,* v. 42, Apr. 20, 1957, p. 32-38, 92, 96.

Advantages and disadvantages; competitive position. 21 ref. (E16c, E21)

260-E. **Observations on the Melting and Casting of Aluminum-Bronze Alloys With Special Reference to Test Bars.** C. V. Wilson and E. V. Tull. *British Foundryman,* v. 50, May, 1957, p. 237-245.

Main difficulties encountered in melting and casting of these alloys; general principles for their solutions; factors affecting soundness; importance of casting design specifically for aluminum bronzes. Principles of sound casting are applied to production of test bars; influence of casting temperature on properties of these bars discussed. Effect of variations in composition, particularly aluminum content, upon physical properties is described. Properties of various standard alloys are surveyed and suggestions made concerning optimum compositions within appropriate specifications. 13 ref. (E10, E25, 1-4; Cu, *Al*)

261-E. **Heterogeneous Distribution of Oxygen in Cast Iron.** G. Blanc and A. Blondel. *British Foundryman,* v. 50, May 1957, p. 245-257.

Experimental vacuum fusion equipment and procedure described. Experiments were devoted particularly to effect on oxygen contents of sampling procedure in relation to location of samples, methods of casting, conditions of storage, types of mold material. Highest oxygen contents were noted near feeders and other areas where nonmetallic inclusions can be trapped and within 1 mm. of surface, especially after storage in air. Implication of these results on mode of occurrence of oxygen in cast iron is considered. 30 ref. (E25, S11r; CI, *O*)

262-E. **Production Problems in the Manufacture of Alloy-Iron Castings.** W. M. Lord. *British Foundryman,* v. 50, May 1957, p. 258-267.

Outline of improvements in production methods in small foundry to increase output and provide wide variety of alloyed and high-duty iron castings. Description of molding unit using special type of standard cast-iron molding box and motorized turnover machine; details of conversion of two cupolas to water cooling; production of spheroidal graphite cast iron; comments on necessary technical control and foundry planning. (E11; CI-q)

263-E. **Aids to Production in a Jobbing Foundry.** I. Rees and D. H. Snelson. *British Foundryman,* v. 50, May 1957, p. 267-288.

Core-assembly method of molding, CO_2 process, application of moldable types of exothermic feeding compound discussed from point of view of flexibility and increase of productivity. 6 ref. (E19, E22)

264-E. **Castings Industry of the United Kingdom.** D. H. Houseman. *Castings,* v. 3, Mar. 1957, p. 15-21.

Brief indication of size and scope of United Kingdom's castings industry. Important developments since 1945 include cupola with preheated blast, water cooling, improvements in refractories, development in rotary and electric furnaces, increasing use of CO_2 and shell molding processes, and automation in molding and cleaning. (E general, A4)

265-E. **Modern Mechanised Foundry of Allied Ironfounders.** *Commonwealth Engineer,* v. 44, Apr. 1, 1957, p. 65-67.

Automatic indexing molding machines, mechanized sand handling plant, hot blast recuperated cupolas and mechanical handling of raw materials are featured. (E general, W19, 1-2, 18-24)

266-E. **Four 8½ Ton Cast Steel Ladles.** *Commonwealth Engineer,* v. 44, Apr. 1, 1957, p. 85-86.

Problems of molding, melting and casting. (E11, W19b, 17-7; ST)

267-E. **Precision Investment Casting Developments.** W. N. Jones. *Foundry Trade Journal,* v. 102, May 2, 1957, p. 529-531.

Brief survey of basic process and recent trends; problems of design,

dimensional tolerance and mechanical properties to be expected. (E15, 17-1)

268-E. Two Grey-Iron Foundries. M. M. Hallett. *Foundry Trade Journal*, v. 102, May 16, 1957, p. 597-602.

Equipment and processes at two British foundries including vertical hoist for charging cupolas, wet baffle spark-arrester, application of shell molding and annealing. (E general, 1-2)

269-E. Drying of Plaster Moulds by Immersed Electrical Wiring. *Foundry Trade Journal*, v. 102, May 16, 1957, p. 613.

Method for quick economical drying of gypsum plaster molds to be used in low pressure casting of aluminum match plate. (E16a, W19g, 1-2)

270-E. Metallurgical Control of Quality in the Production of Copper-Base Alloy Castings. A. R. French. *Institute of Metals, Journal*, v. 85, Mar. 1957, p. 293-315.

Extensive review on commonly used copper-base alloys; their constitution, effects of composition and structure on mechanical properties; influence of reducing gases and other impurities; control of metal quality during alloying and melting; tests for metal quality; modes of solidification; feeding and gating systems and control of casting quality. 124 ref. (E25, E22; Cu)

271-E. Liquid Shrinkage. Problems of Compensation in Steel Castings. E. Longden. *Iron and Steel*, v. 30, May 1957, p. 173-178.

Typical hydraulic cylinder types were used to illustrate various gating and feeding systems for pouring steel castings with special emphasis on obtaining progressive order of metals solidification. (To be concluded.) (E25n, E22; ST)

272-E. Status of the Technology for Casting Titanium. G. H. Schippereit, J. G. Jura and R. M. Lang. *Light Metal Age*, v. 15, June 1957, p. 16. (CMA)

Research progress relating to melting furnaces, mold materials and titanium casting alloys is evaluated. The development of an inert, cheap mold material would be a major breakthrough. Best molds now are obtained from graphite; mold life may extend to 50 castings if draft is adequate, re-entrant angles are absent and expendable inserts are used. Skull melting furnaces look promising. Superheating of melts allows the gating systems to be small. (E general; Ti)

273-E. Schueler Automatic Shell Core Making Machine. *Machinery*, v. 90, Apr. 19, 1957, p. 885-887.

Automatic shell core-making machine uses pre-coated sand from pressurized copper for production of cores at rate of one per min. in core boxes of up to 12 cu. in.; sand bonded by electrically heated platens. (E21, E19c, 1-2)

274-E. Pressure Die Casting at the Works of Dyson and Co., Enfield (1919) Ltd. *Machinery*, v. 90, May 31, 1957, p. 1223-1232.

Large-scale casting of zinc and aluminum alloys. Atomic hydrogen welding used for adaptation and repair of dies. During initial stages of operation of new dies, detailed records are kept of machine settings which give best results. Techniques and dies employed; specifications of castings for oil pumps, office equipment; typewriter front bars, electrical switchgear boxes, electric motors, segmental tire molds. (E13, T1, T10, 17-7; Zn, Al)

275-E. Automatic Processes in Die-Casting Production. H. K. Barton. *Metal Industry*, v. 90, May 3, 1957, p. 345-349.

Developments in electronic controls for casting cycle; mechanisms for automatic casting transfer and methods of meeting work handling problems. (To be concluded.) (E13, 1-2)

276-E. Automatic Processes in the Foundry. J. B. McIntyre. *Metal Industry*, v. 90, May 3, 1957, p. 360-363, 368.

Die casting; control of sand moisture; cupola charging equipment; automatic molding machines of the jolt squeeze type; mechanized core production; cut-off machines; automatic shot blast cleaning; other techniques and equipment that have automated sections of foundry. (E general, 18-24)

277-E. Die Casting Process. *Precision Metal Molding*, v. 15, May 1957, p. 33-38.

Characterizes process; lists metals that can be cast; accuracy obtainable; advantages and limitations of method. Twenty examples of aluminum, zinc and magnesium die castings. (E13; Al, Zn, Mg)

278-E. Permanent Mold Casting Process. *Precision Metal Molding*, v. 15, May 1957, p. 41-44.

Nature of the process; metals that can be cast; accuracy obtainable; advantages and limitations. Twelve examples of castings made with permanent mold process from aluminum alloys and other metals. (E12)

279-E. **Investment Casting Process.** *Precision Metal Molding,* v. 15, May 1957, p. 45-50.

Characterizes process; lists metcan be cast; accuracy obtainable; advantages and limitations of method; 20 examples of castings made by investment process. (E15)

280-E. **Plaster Mold Casting Process.** *Precision Metal Molding,* v. 15, May 1957, p. 57-59.

Evaluates process; lists metals that may be cast; advantages; limitations and accuracy obtainable. Eight examples of castings made by plaster mold method. (E16a)

281-E. **Shell Mold Casting Process.** *Precision Metal Molding,* v. 15, May 1957, p. 61-63.

Characteristics of the process; metals that can be cast; accuracy obtainable; advantages and limitations of method. Eight examples of castings produced by shell molding processes. (E16c)

282-E. **Hydraulic Trim Presses for Die Castings.** *Precision Metal Molding,* v. 15, May 1957, p. 67-69.

Hydraulic presses for trimming parting line flash from diecastings; their adjustments and advantages. (E24h, 1-2; 5-11)

283-E. **More Shell Castings for Autos.** *Steel,* v. 140, Apr. 15, 1957, p. 138, 141.

Castings produced in shell molds with close tolerances and cleaner surfaces. Used as automatic transmission, steering gear and other auto parts. (E16c, T21c, 17-7)

284-E. **Birth of a Bell.** *Tin and Its Uses,* no. 39, Summer 1957, p. 1-5.

Practices at a Whitechapel foundry in the founding of bells; bronze consisting of 24% tin and 75% copper is used. Techniques in molding with loam; pouring practices; a few of the famous bells produced in the foundry in the last 400 years. (E11, T9r, 17-7; Cu-s)

285-E. (French.) **Melting Experiments in the Cupola With Oxygen Enriched Blast.** M. F. Kinet. *Fonderie Belge,* no. 3, Mar. 1957, p. 31-35.

Equipment; influence of the injection of oxygen on the lining, the proportion of coke, temperature of the cast iron, speed of combustion, hourly production rate; influence on the composition of cast iron; conclusions drawn. 9 ref. (E10a, W18g, 1-2; CI)

286-E. (German.) **Effect of Gas Scavenging Magnesium Consumption in the Production of Spheroidal Graphite Cast Iron.** Wilhelm Patterson. *Giesserei,* v. 44, Apr. 25, 1957, p. 216-227.

Mechanism of the scavenging effect; treating cast iron melts by gas scavenging; suppression of interfering elements; theory of the crystallization of spheroidal graphite. (E22s, E25q; CI)

287-E. (German.) **Graphitization of Molten Cast Iron by Gas Scavenging.** George Blanc and Nicolas Volianik. *Giesserei,* v. 44, May 9, 1957, p. 277-290.

Theory of the method and results of small-scale experiments; advantages of graphitization by gas scavenging; applications and conclusions. (E22s, E25q; CI)

288-E. (German.) **The Foundry in the Age of Automation.** Paul Schiegries. *Giesserei,* v. 44, June 6, 1957, p. 337-342.

Summary of the development of foundry facilities for molding and melting; prerequisites of automation; examples showing the use of automatic equipment in foundries. (E general, 1-2, 18-24)

289-E. (German.) **Dust-Free Cleaning and Dressing.** Jules Kistler. *Giesserei-Praxis,* v. 75, Apr. 25, 1957, p. 159-167.

A review of the cleaning and dressing industry and new machines in use, with particular emphasis on dust control. 15 ref. (E24, A8a)

290-E. (German.) **Graphitization and Quality of Gray Cast Iron.** E. A. Hohmann. *Giesserei-Praxis,* v. 75, Apr. 25, 1957, p. 174-175.

Quality of gray cast iron is dependent on the factors (other elements present, overheating of the melt and speed of solidification) which influence graphite formation in the process. (E25n, E25q; CI-n)

291-E. (German.) **Testing and Evaluation of Bonding Materials for Foundry Sands.** Hans Reininger. *Giesserei-Praxis,* v. 75, Apr. 25, 1957, p. 176-181.

Influence of the bonding sand (its chemical and mineral composition, shape and size of individual grains), water content, nature of the bonder and blending of the bonder mixture. (E18n)

292-E. (German.) **Chill or Mask Casting in Foundries.** F. Paschke. *Gies-*

serei-Praxis, v. 75, May 25, 1957, p. 213-219.

Detailed account of the process from physical requirements of molds and materials used to mold preparation and variations in equipment available. (E19, E22q)

293-E. (German.) **Gates in Iron Casting.** *Giesserei-Praxis,* v. 75, May 25, 1957, p. 220-222.

The following characteristics determine shape, size and location of gates in casting: variation in wall thickness of mold, shape of piece cast, weight, core location and gas formation, dry or green sand mold, machining necessary. (E22p; CI)

294-E. (German.) **Working With Water Glass Containing Molding Sand, Without Carbon Dioxide Hardening, for Gray Cast Iron and Cast Steel.** Alfred Gebauer and Otto Gerstmann. *Giessereitechnik,* v. 3, Apr. 1957, p. 73-77.

Characteristics of water glass containing molding sands which harden without the presence of carbon dioxide; model can be removed from the mold which is still plastic; less danger of damage at corners and edges, less tapering necessary; pinning of square nails may be omitted. (E18n; CI, ST, 5-10)

295-E. (German.) **Should a Mold Be Ventilated During Casting by Means of Risers.** Walter Göschel. *Giessereitechnik,* v. 3, Apr. 1957, p. 85-88.

Molds should be ventilated with covered risers if gases are permitted to escape in the direction of the risers by proper pouring technique and correct speed. (E22q)

296-E. (German.) **A New Molding Box With Minimum Backfilling.** Karl Bock. *Giessereitechnik,* v. 3, May 1957, p. 105-107.

New guide bushings and guide pins in the molding box result in technical improvements based on coarse and fine guides, whereby cylindrical, conical, round and oblong hole guides join for better results. (E19, 1-2)

297-E. (German.) **Results of Covering Risers.** Walter Göschel. *Giessereitechnik,* v. 3, May 1957, p. 111-113.

Fewer gas bubbles and scales appear in castings in which each riser is regularly covered. (E22q)

298-E. (Japanese.) **Effect of Vent Wire on Permeability of Molding Sands.** Kenji Hashimoto. *Casting Institute of Japan, Journal,* v. 29, Feb. 1957, p. 72-76.

In molding practice of small castings a vent wire is used to control the permeability of the sand. Its quantitative effect, however, is unknown. Presentation of fundamental data on the vent wire; experimental equations; conclusions. (E19)

299-E. (Japanese.) **Investigation of Sand Mold—Burning and Fusion on the Casting Surface.** Goro Ohira and Mahito Koizumi. *Casting Institute of Japan, Journal,* v. 29, Feb. 1957, p. 76-87.

Siliceous and natural sand mold with some binders were applied for iron castings. It was noted that there were two kinds of burning, surface peel burning and lumpy burning. The former appeared in the castings in fine sand mold and often converted into fusion with less refractory sand, while the latter occurred in rather coarse sand connected with metal penetration. 12 ref. (E19)

300-E. (Japanese.) **Segregation in Castings.** Kazuo Yasuda and Kiichiro Amano. *Casting Institute of Japan, Journal,* v. 29, Feb. 1957, p. 97-103.

The determination of segregation was made by local spectrographic analysis on samples of 10% Sn-Cu alloy cast into green sand mold and on samples made of the same alloy treated with zirconium and cast into water-cooled metal and green sand molds respectively. Detailed analysis of results of these experiments. 3 ref. (E25n, Cu, *Sn,* 9-19)

301-E. (Japanese.) **Testing Method of Clay Content in Foundry Sand.** Jiro Kashima. *Casting Institute of Japan, Journal,* v. 29, Feb. 1957, p. 104-107.

The adsorption test was made by utilizing 1/10 *N* sulphuric acid solution containing nickel ions instead of using organic coloring matters heretofore employed. Satisfactory results were obtained on the relation between green strength of the sand and clay content. (E18r)

302-E. (Japanese.) **Heat Absorbency of the Mold and the Soundness of Castings. Report 2. On the Fundamental Characteristics of Various Chills.** Masataka Sugiyama, Morio Takahashi and Eisuke Niiyama. *Casting Institute of Japan, Journal,* v. 29, Feb. 1957, p. 108-116.

Heat-absorbing characteristics of various chills were quantitatively observed by temperature measuring method and their effects on the soundness of castings were discussed. Outline of results obtained. 4 ref. (E22r, P12k)

303-E. (Japanese.) **Study on High-Temperature Properties of Core Sand for Steel Castings.** Shizuya Maekawa and Hiroshi Akimoto. *Casting Institute of Japan, Journal,* v. 29, Mar. 1957, p. 163-170.

The relation between cracking of core sand and its strength at high temperatures. Under the same testing condition, natural silica sand shows higher hot strength and less cracking than the synthetic; sand having wide range of grain distribution and containing much moisture and clay has shown high hot strength and less mold cracks; bentonite bonded sand gives higher hot strength and less cracks than clay bonded; hot strength increase will reduce the degree of expansion and the occurrence of cracks. 8 ref. (E18r, 2-12; ST)

304-E. (Japanese.) **Studies on Crushing Properties of Foundry Sand. Report 1. On the Mechanism of Impact Crushing of Silica Sand.** Ryojiro Kono and Muneo Suzuki. *Casting Institute of Japan, Journal,* v. 29, Mar. 1957, p. 170-176.

Mikawa, Chikuma and Seto silica sands served as samples. The variation of grain distribution of each sand after impact force was checked. The impact mechanism of these sands did not agree with the law of Rittinger and Kick, but tallied with the Rosin-Rammler distribution formula. The grain shape of a silica sand does not vary by crushing until it becomes a single crystal, but as the grain is crushed further it gradually changes into angular type. 11 ref. (E18r)

305-E. (Japanese.) **Outlook on the Theories of Spheroidal Graphite Formation.** Takeomi Okumoto. *Casting Institute of Japan, Journal,* v. 29, Mar. 1957, p. 177-188.

Method of graphite growth, supersaturation theory, carbide decomposition theory, melt theory, nucleus theory, super-cool theory, surface energy theory, absorption theory, aggregation theory and dislocation theory. 55 ref. (E25n; CI-r)

306-E. (Swedish.) **Design of Thin Walled Gray Iron Castings.** T. Kappelin and G. Fernheden. *Gjuteriet,* v. 47, Apr. 1957, p. 57-60.

Thickness of casting, dimensional tolerances, pattern draft, fillets and openings for core prints and removal of the core. Closer cooperation on a fundamental level between engineers and foundrymen could simplify the machining of the castings and reduce the risk of shrinkage cavities. (E11, 17-1; CI-n)

307-E. Die Casting at the Hoover Co. Kenneth L. Mountain. *Foundry,* v. 85, June 1957, p. 98-105.

Continuing research, quality control, design preplanning and production experience result in high-quality die castings. Compositions of zinc and aluminum alloys and the methods used in die casting, trimming, finishing, gating, venting at the Hoover Co. (E13; Zn, Al)

308-E. The Carbon Dioxide Process. Walter E. Gruver. *Foundry,* v. 85, June 1957, p. 106-110.

Basic reaction of carbon dioxide with sodium silicate in forming silica gel for giving strength to sand cores and molds. Relation of core strength after gassing and after baking to gassing time, sodium silicate content and other materials present. (E18)

309-E. How to Design for Sound Stainless Steel Castings. J. L. Lessman. *Foundry,* v. 85, June 1957, p. 114-117.

Suggestions in casting design for eliminating shrinkage, cracks and defects including notes on feeding, casting section, uniformity and thickness, proper design of cored areas and corners and consideration of typical problems. (E general, 17-1; SS)

310-E. Swedish Foundry Prepares Sand Automatically. C. G. Soderlund. *Foundry,* v. 85, June 1957, p. 118-121.

Automatic mixing, moisture control, ventilating and material conveying systems; moisture content of sand adjusted on basis of dielectric property of sand measured between condenser plates. (E18p, E18r, 18-24)

311-E. Foundry Expansion. Robert H. Herrmann. *Foundry,* v. 85, July 1957, p. 86-90.

Operations following a carefully planned expansion in an iron, brass and aluminum foundry including molding, coring, pouring and cleaning practices. (E11; CI, Cu-n, Al)

312-E. Brass Casting Design From the Foundry Viewpoint. Harry St. John. *Foundry,* v. 85, July 1957, p. 91-93.

Ease of casting and coring should be considered in the design of castings and specification of alloys to be employed. (E11, 17-1; Cu-r)

313-E. A New Method for Studying Riser Requirements of Castings. John Varga, Jr., *Foundry,* v. 85, July 1957, p. 106-109.

Method developed for presenting in graphical form results of research on the shape of risers required for casting simple shapes. By selecting suitable parameters and plotting on log-log co-ordinates, data were found to produce straight lines making it easier to analyze and study feeding requirements. 5 ref. (E22q; CI)

314-E. Quality Control in Pressure Die-Castings. J. E. Carvell. *Metal Industry,* v. 90, Apr. 26, 1957, p. 325-327, 334.

Important procedures include chemical analysis, radiographic inspection, visual control, dimensional control, weight testing and careful checking of cores and ejectors. (E13, S general)

315-E. New Look in Cleaning Rooms. Cecil King. *Modern Castings,* v. 31, June 1957, p. 52-54.

Vibrating shakeout, punches, shears, grinders and shot-blast units; used in cleaning cast cylinder block for automobiles. (E24, 1-2)

316-E. Guide to Engineered Castings. *Modern Castings,* v. 31, June 1957, p. 55-70.

Recommendations for structural designs covering section proportioning and thickness; molding and coring simplification; guide for selecting casting alloys gives information on the range of mechanical and physical properties of gray iron, pearlitic malleable iron, nodular iron, carbon and low-alloy steels, aluminum, copper, magnesium, nickel and zinc-base alloys; summary of molding and casting processes and their characteristics. 65 ref. (E general, 17-1)

317-E. Instrument Maker Solves Production Problems. L. H. Fitch. *Precision Metal Molding,* v. 15, June 1957, p. 36-37.

Bronze and zinc investment castings used to make complex precision instruments economically. (E15, X general, 17-7; Cu-s, Zn)

318-E. (German.) **Contour Precision in Chilled Castings.** Ernst Brunhuber. *Giesserei-Praxis,* v. 75, Apr. 10, 1957, p. 134-136.

A method for obtaining precision cast pieces, examples given to illustrate technical difficulties involved. (E22r)

319-E. (Japanese.) **Casting Stress in Wheel Arms.** Shosaku Kobayashi. *Casting Institute of Japan, Journal,* v. 29, Feb. 1957, p. 87-97.

Cracks, breakage and deformation are sometimes introduced into castings by a small amount of shock after they are completed. Factors responsible for increasing casting stress are cooling rate, high moisture content in molds, variation in volume to surface area of different parts. Annealing the casting is a good way to reduce casting stress; high-temperature casting is also recommended. 7 ref. (E25n, Q25; 9-22, 9-24)

320-E. (Japanese.) **Studies on Fluidity of Cast Steel.** Zenichiro Tako, Ituo Araki, Masayasu Arikawa and Takaaki Shimose. *Iron and Steel Institute of Japan, Journal,* v. 43, Apr. 1957, p. 457-465.

Simple and accurate measuring method of fluidity for the purpose of establishing standard melting practice of electric cast steel and effect of oxygen content in molten steel. 21 ref. (E25p; ST)

321-E. (Japanese.) **Effects of Coke Size in Cupola Operation.** Nobutaro Kayama, Katsutoyo Nozaki and Takio Takamori. *Casting Institute of Japan, Journal,* v. 29, May 1957, p. 333-342.

The cupola used had an internal diameter of 520 mm., effective height of 2310 mm., tuyere ratio of 5, and no forehearth. As coke size got smaller, the amount of carbon dioxide in effluent gas from cupola decreased, tapping temperature dropped and coke bed lowered remarkably. Fluctuation of operating conditions were least when medium-sized coke was used. The same held true for the properties of the castings. 4 ref. (E10a; RM-j43)

322-E. (Japanese.) **Studies on CO_2 Process, Especially on Sodium Silicate Binders.** Jiro Kashima and Hisao Miyasaka. *Casting Institute of Japan, Journal,* v. 29, May 1957, p. 348-353.

Sodium silicate binders for CO_2 process; water-soluble starch, dextrine, cornstarch and silica sol mixed with waterglasses investigated; physical properties of molds bonded with such specially prepared waterglasses studied; reactivity of binders with CO_2; strength, ease of mulling and stripping. About 1% addition of organic binders such as water-soluble starch, dextrine and cornstarch is preferable; about 5% addition of silica sol is recommended. (E18n)

323-E. (Japanese.) **Segregation in Castings. Report 5.** Kazuo Yasuda and Kiichiro Amano. *Casting Institute of Japan, Journal,* v. 29, May 1957, p. 354-361.

Three different systems of aluminum alloys, Al-Cu, Al-Mg and Al-Si, were used in these experiments. In the rapidly cooled castings, inverse segregation appeared at the outer and inner layers, as well as normal segregation in the intermediate layer (i.e., two stages of inverse segregation were indicated). In the slowly cooled castings, however, the inverse segregation at the outer layer did not appear. 6 ref. (E25n; Al, 9-19)

324-E. (Russian.) **Casting Systems for Aluminum and Magnesium Alloys.** M. M. Vasilenko. *Liteinoe Proizvodstvo,* no. 2, Feb. 1957, p. 2-3.

Description of the bottom fed casting technique; advantages of the top fed technique; diagrams of molds of both techniques. (E22; Al, Mg)

325-E. (Russian.) **Fast Preparation of Coated Sand Mold Mixtures.** A. I. Korotkov. *Liteinoe Proizvodstvo,* no. 2, Feb. 1957, p. 4-5.

Description of dry, hot and cold sand-resin blends; deficiencies of the three methods. A method utilizing a prewetted sand is described. The most convenient solvent for sand prewetting is furfural. 3 ref. (E19n)

326-E. (Russian.) **Automation of Shell Mold Production.** I. V. Efimov. *Liteinoe Proizvodstvo,* no. 2, Feb. 1957, p. 6-8.

A semi-automatic apparatus for wax mold production is described. Drawbacks of semi-automatic production are given. (E19c, 1-2)

327-E. (Russian.) **Economics of Foundry Production in East Germany.** F. Nauman. *Liteinoe Proizvodstvo,* no. 2, Feb. 1957, p. 22-24.

The necessity of lowering the reject percentage (now 30%) is stressed. Chill mold technique is recommended. Designers are urged to use more iron castings in place of steel castings. The use of magnesium-treated cast iron should be increased. New methods such as centrifugal castings, die casting and use of shell molds are of great value. (E general, A4; CI, ST)

328-E. (Swedish.) **How to Get Tight Castings.** M. Itzel and G. Lindström. *Gjuteriet,* v. 47, May 1957, p. 73-76.

Choice of material and casting design in a high-pressure hydraulic system. Malleable iron is preferred to steel. Molding and feeding are determining factors for the design. (E11, T4d, 17-7; CI-s, 17-1)

329-E. (Swedish.) **Rationalization in a Fettling Shop.** Henry Nilsson. *Gjuteriet,* v. 47, May 1957, p. 77-81.

A 33% capacity increase has been obtained by a rationalization with special regard to centrifugal fettling machines, exchangable tumbling mills, transportation and chipping and grinding of rough castings. (E22, E24, 1-2, 18-17)

330-E. **Production of Machine-Tool Castings.** G. W. Nicholls. *British Foundryman,* v. 50, June 1957, p. 296-308.

Production flow diagram and manufacturing methods. Standardization and effective control are applied to all foundry operations and materials including sands, refractories, drying technique, gating and risering techniques, venting, metal operations, pouring and cleaning. 5 ref. (E11)

331-E. **Hot-Blast Cupola as an Economic Unit for Producing Castings to B.S.1452, Grade 12.** J. Henderson. *British Foundryman,* v. 50, June 1957, p. 309-323.

Description of plant, charge composition, metallurgical control, daily analysis results, slag analyses. Comparison with cold blast operating costs. (E10a; CI)

332-E. **Fuel Oil in Foundries.** T. Marsden. *British Foundryman,* v. 50, June 1957, p. 324-334.

Formulas for calculation of heat losses in tanks and pipelines and pressure losses in ring mains. Hints on venting, filtering and ring main and tank design. Limitations, advantages and disadvantages of popular types of burners.
(E general, A11e, RM-k30)

333-E. **The Carbon Dioxide Process.** G. E. Parramore. *British Foundryman,* v. 50, July 1957, p. 359-371.

Progress in production of iron and nonferrous castings using CO_2 process. Details of tests investigating thermal properties of CO_2 process sand, dry sand, oil sand and green sand containing 5.5% moisture. 6 ref. (E11, E18r)

334-E. **An Evaluation of the Carbon Dioxide Process.** J. E. O. Little. *British Foundryman,* v. 50, July 1957, p. 372-379.

Costs are compared with oil-sand core making and dry-sand molding. (E19, E21, 17-3)

335-E. Development of Die Casting in Europe. R. Lewis Stubbs. *Foundry Trade Journal,* v. 102, June 6, 1957, p. 691-696.

Historical development, current methods and advances in zinc and aluminum alloy die casting in Great Britain and Continental Europe. (E13; Zn, Al)

336-E. Cold-Setting Cores. *Foundry Trade Journal,* v. 102, June 13, 1957, p. 717-720.

British and American practices in mixing sand, drying oil and oxygen releasing catalyst in the production of cold setting cores; advantages of cold setting cores. (E21g)

337-E. Stewarts and Lloyds' Tollcross Steel Foundry. A. R. Parkes. *Foundry Trade Journal,* v. 102, June 13, 1957, p. 723-730.

Illustrated description of Scottish iron factory giving plant layout, compositions of irons and steels cast; note on sand preparation, molding, drying, coremaking, knock-out, heat treatment, cleaning, handling and testing facilities and practices. (E general)

338-E. Founding of Magnesium. E. F. Emley. *Foundry Trade Journal,* v. 103, July 11, 1957, p. 33-38.

Casting alloys, preliminary considerations in melting and refining, preparation of melts and pouring procedure. (To be continued.) 15 ref. (E general; Al)

339-E. Founding of Magnesium. E. F. Emley. *Foundry Trade Journal,* v. 103, July 11, 1957, p. 33-38.

Sand casting, gravity and pressure casting of magnesium alloys. Advantages and applications of magnesium castings. 34 ref. (E11, E13; Mg)

340-E. Vacuum Die Castings: Quality *in,* Porosity *Out*. F. J. Egan, Jr., *Iron Age,* v. 179, May 9, 1957, p. 107-109.

Zinc and aluminum die castings made with vacuum equipment are free from porosity and production is increased. Vacuum equipment consists of hood enclosing die platen area, vacuum pump and accumulator. (E13, 1-2, 1-23; Zn, Al)

341-E. Making Components for Oil Filters, Guns and Lubricators. *Machinery,* v. 90, May 24, 1957, p. 1140-1152.

Machines and operations in die casting zinc alloy grease gun barrels and caps; boring and thread chasing operations on cast caps; milling, boring and other operations. (E13, G17, 1-2; Zn)

342-E. Shell Castings. H. G. Sieggreen. *Mechanical Engineering,* v. 79, June 1957, p. 560-562.

Procedure, advantages and examples. (E16c)

343-E. Making Quality Brass and Bronze Castings. Defects Due to Melting, Pouring and Solidification. Robert A. Colton. *Modern Castings,* v. 32, July 1957, p. 29-34.

Enumerates types of defects due to contamination, gas and melted metal, improper pouring temperature and turbulence. Procedure recommended for eliminating defects. (E25n, 9; Cu)

344-E. How We Converted to Water-Cooled Cupolas. James McConville and Andrew Fishels. *Modern Castings,* v. 32, July 1957, p. 41-44.

Problems encountered and benefits obtained with water-cooling installations on six cupolas. (E10a, 1-2)

345-E. Is CO_2 Necessary? Carl E. Wulff. *Modern Castings,* v. 32, Aug. 1957. p. 28-29.

Small cores may be hardened by using dry nitrogen or dry compressed air instead of CO_2. (E21g)

346-E. Technology for Casting Titanium. G. H. Shippereit, R. M. L. Ang and J. G. Kura. *Modern Castings,* v. 32, Aug. 1957, p. 33-48. (CMA)

Ten years of titanium progress are reviewed. No titanium casting process is yet commercial, but research has covered many aspects of titanium casting problems. Various types of casting furnaces are surveyed. In general, machined graphite molds are best, but small parts have been made with expendable molds of powdered graphite or refractory oxides. The use of cerium sulphide crucibles appears promising although some loss of ductility in the casting occurs. (E general; Ti)

347-E. Die Casting Aluminum and Zinc. Pt. 1. *Modern Metals,* v. 13, June 1957, p. 72-91.

Growth of die casting industry, machine design, die design and construction. (To be continued.) (E13, 1-2; Al, Zn)

348-E. Castings as Strong as Forgings. Conrad A. Parlanti. *Product Engineering,* v. 28, June 1957, p. 170-174.

Use of anodized aluminum molds with controlled pouring rate is adaptable to large or small castings in aluminum, magnesium, cast iron and steel. Advantages and limitations are given.
(E12, W19g, 17-7; Al, Mg, CI, ST)

349-E. Air Setting Speeds Coremaking. Daniel R. Chester. *Steel,* v. 141, July 22, 1957, p. 120-123.

Oil binder which oxidizes with air is used to develop green strength in sand. Advantages: fewer rods needed, reduced baking time, excellent collapsibility, accurate dimensions. (E21g, E18n)

350-E. Welding and Related Procedures Encountered in a Modern Steel Foundry. Samuel W. Gearhart, Jr. *Welding Journal,* v. 36, July 1957, p. 693-702.

Welding processes adopted in foundry to improve casting quality, simplify casting design; incorporation of castings in welded structures. Limitations and engineering aspects. (E general, K general, 17-1)

351-E. Shell Cores Offer New Design Advantages. Gordon Martin. *Western Machinery and Steel World,* v. 48, June 1957, p. 106-107.

Examples illustrate accuracy of interior surfaces of gray iron castings made with shell cores. (E16c; CI-n)

352-E. (German.) **Chemical Reaction in the Hearth of Melting Crucibles.** K. Wickert. *Brennstoff, Wärme, Kraft,* v. 9, Mar. 1957, p. 105-118.

Catalytic effect of solid, liquid and gaseous substances with regard to oxidation of SO_2 to SO_3; behavior of SO_2 and H_2S in oxidizing and reducing atmospheres; change in the chemical composition of catalysts; condensation point curve for H_2SO_4 as corrosion product of iron reaction with H_2S, SO_2 and SO_3/H_2O; quantitative comparison of corrosion of iron at various temperatures; investigation of chloride corrosion; analysis of hearth gases in different height furnaces; reaction between inorganic materials in solid state (coating and ashes); reaction between iron and solid substances.
(E10; Fe, 14-10)

353-E. (German.) **Waterglass Molding Process. Pt. 3.** Siegfried Böhmer. *Giessereitechnik,* v. 3, Mar. 1957, p. 49-52.

Heating behavior of carbon dioxide hardened waterglass solution; mixing, hardening of mold material, and its behavior on heating. 29 ref.
(E19)

354-E. (German.) **Plastics for Patterns and Pattern Plates.** Otto Quappe. *Giessereitechnik,* v. 3, Mar. 1957, v. 57-60.

Properties and processing of organic plastics and pattern material developed in the German Democratic Republic; making of patterns and plates, and the use of pattern material. (E17; NM-d)

355-E. (Italian.) **Highlights of Progress in Steel Founding.** G. Blasich. *Fonderia Italiana,* v. 6, Jan. 1957, p. 3-7.

Résumé of world-wide technological developments in past ten years with reference to furnaces, refractory linings, molding methods. Brief description of Croning, lost wax, Shaw, "Mercast" and Schmidt and Phillips processes; characteristics of castings produced. (E general; ST)

356-E. (Italian.) **Qualitative Improvement of Cast Iron.** D. Fortino. *Fonderia Italiana,* v. 6, Jan. 1957, p. 8-15.

Possibility of using improved iron castings where steel has previously been specified on basis of indicated refinements in manufacture of gray, alloy, pearlitic malleable, spheroidal and high-alloy cast irons for special uses. Heat treatments for improving characteristics of iron castings. 5 ref. (E11, 2-14; CI, 17-7)

357-E. (Italian.) **Ten Years of Progress in the Founding of Nonferrous Metals.** E. Hugony. *Fonderia Italiana,* v. 6, Jan. 1957, p. 16-22.

Technological developments; chemical data and mechanical characteristics of castings made of nickel, aluminum, magnesium, lead, copper, tin, zinc and their alloys. References to several countries with special reference to Italian activity.
(E general; EG-a38)

358-E. (Italian.) **Equipment for Treating and Controlling Clays.** T. LoRusso. *Fonderia Italiana,* v. 6, Feb. 1957, p. 54-56.

Components of a good molding clay mixture; plant and laboratory equipment required for efficient clay work. (E19; NM-f)

359-E. (Italian.) **Shell Casting.** M. Noris. *Fonderia Italiana,* v. 6, 1957, p. 57-58.

Developments during past ten years in technique of centrifugal casting of iron and nonferrous metals; brief description of Eaton process. (E14, E16c)

360-E. (Italian.) **Progress in Casting Finishing.** G. Pogatschnig. *Fonderia Italiana,* v. 6, Feb. 1957, p. 59-64.

Developments during past ten years; sand removal through heat treatment, finish cleaning and straightening. (E24)

361-E. (Italian.) **High-Quality Cast Irons and How to Produce Them.** Giorgio Giacomelli. *Fonderia Italiana,* v. 6, Apr. 1957, p. 149-151.

Three types noted: gray; high-strength (with subdivisions of high-quality gray and alloy cast irons); malleable. Structure of high-quality gray; manufacturing processes, including Lanz and Meehanite. (E11, Q general, M27; CI)

362-E. (Japanese.) **Degassification of Molten Aluminum.** Haruo Shimojo, Takaya Hiraoka and Eizo Shimizu. *Light Metals,* v. 7, May 1957, p. 51-59.

By holding molten metal for a certain time, the gas in the melt can be removed; gas content of the melt and the effect on gas cavities in the cast aluminum for various holding conditions measured by the specific gravity method. 8 ref. (E25s; Al)

363-E. (Russian.) **Casting of Large Steel Parts Using Blended Steel.** G. A. Ravitch and G. V. Morozkov. *Liteinoe Proizvodsvo,* no. 1, Jan. 1957, p. 1-3.

Casting techniques for castings up to 15 tons using various blends of electro and bessemer steel; chemical composition of the steels is tabulated. (E11; STT)

364-E. (Russian.) **Modernized Instruments for Testing of Mold and Core Sand Mixtures.** N. P. Dubinin. *Liteinoe Proizvodstvo,* no. 1, Jan. 1957, p. 8-9.

East German instruments for measurement of the sand mixture strength, gas permeability and fineness. (E18r, 1-3)

365-E. (Russian.) **Investigation of Cast Iron Desulpurization by Magnesium.** V. I. Lakomski. *Liteinoe Proizvodstvo,* no. 1, Jan. 1957, p. 9-11.

Kinetics and thermodynamic equilibrium of the magnesium and iron sulphide reaction. 4 ref. (E25, P12, CI, *S, Mg*)

366-E. (Russian.) **Increasing Temperature in Cupola Cast Iron Melting.** I. T. Garkusha. *Liteinoe Proizvodstvo,* no. 2, Feb. 1957, p. 18-20.

Description of the cupola processes in actual foundry practice; experimental melting; details of the cupola dimensions; temperature, coke usage and volume of air. 3 ref. (E10a; CI)

367-E. (Russian.) **Degasification of Aluminum Alloys by Direct Current Under Reduced Pressure.** V. G. Korotkov. *Liteinoe Proizvodstvo,* no. 2, Feb. 1957, p. 20-22.

The alloy density is discussed as a function of current density and vacuum at constant temperature. Higher current density and lower pressure give less porous castings. However, intermediate current density of 1 to 3 amp. per sq.cm. should be avoided. The experiments were repeated with varying temperature. Lower temperature gives less porous castings. (E25s; Al)

368-E. (Russian.) **Metallurgical Problems in the Centrifugal Casting of Pipes.** I. B. Khazan. *Liteinoe Proizvodstvo.* No. 4, Apr. 1957, p. 1-7.

Tubes cast centrifugally in metallic molds are often characterized by porosity, brittleness and poor corrosion resistance. Some of the latest centrifugal casting machines are designed along improved kinetic principles, but still are based upon concepts used in casting in earthen molds. Application of sound metallurgy would ensure better products. The influence of Si, C, Mn, P, S, Ti, Cr and Cu in the cast iron in different quantities is discussed. (E14, 2-10; CI, 4-10)

369-E. (Russian.) **Casting of Acid-Proof and Heat Resisting Alloys.** K. I. Vashchenko and L. I. Rostovtzev. *Liteinoe Proizvodstvo,* no. 4, Apr. 1957, p. 7-10.

To meet the increasing demand of chemical and petroleum refining industries, new acid and heat resisting alloys were developed. Previously corrosion resisting parts were forged or rolled but they now can be cast. Alloys with low chromium content may be used in place of expensive stainless steel. The chromium and carbon in these alloys are found in such carbides as $(FeCr)_7C_3$ and $(FeCr)_4C$. Nickel and molybdenum in noticeable quantities raise corrosion resistance of the alloys in reducing media. 5 ref. (E general, R general; SS, SGA-g, SGA-h)

370-E. (Russian.) **Shrinkage Porosity in Castings.** I. B. Kumanin. *Liteinoe Proizvodstvo.* no. 4, Apr. 1957, p. 18-23.

A molten mass first forms a skin along its outside surfaces; then by consequent cooling the entire mass

solidifies. Since shrinkage near the skin is less intense than in the interior, voids are formed. These may be concentrated in temperature nodes, or dispersed through the whole casting. Experiments showed that volume of the voids, as well as porosity, is definitely related to certain portions of the phase diagrams. (E25n; 9-18)

371-E. (Russian.) **Shell Molds Produced by Chemical Hardening Method.** B. U. Feigelson. *Liteinoe Proizvodstvo,* no. 5, May 1957, p. 1-3.

Optimum conditions for shell mold production using sand, liquid glass and carbon dioxide. Factors influencing breaking, strain and hardening of the molds. Requirements for the composition of the liquid glass, quality of sand and organic additives. Mixing technique. 5 ref. (E19c)

372-E. (Russian.) **Steel Castings for Hydraulic Turbines.** I. D. Vasilev. *Liteinoe Proizvodstvo,* no. 5, May 1957, p. 5-10.

Composition and mechanical properties of the steel; rotor wheel mold and cores; sand mixture compositions; details of rotor and stator casting. (E11, W11n, 17-7; ST)

373-E. (Russian.) **Properties of Copper Alloy Castings Made by Lost Wax Process.** V. G. Baradanantz. *Liteinoe Proizvodstvo,* no. 5, May 1957, p. 10-12.

Superiority of the casting method over mechanical methods of copper alloy forming; method of pattern making; composition of seven alloys; properties of the castings as a function of the temperature. (E15; Cu)

374-E. (Russian.) **Perfection of Cast Iron Piston Casting Technology.** P. A. Karkhanin. *Liteinoe Proizvodstvo,* no. 5, May 1957, p. 12-14.

Description of the die and composition of the core mixing sand; advantages of slow cooling process; graphs show cast iron piston hardness and composition. (E11; CI)

375-E. (Russian.) **Apparatus for Adding Manganese to Cast Iron.** S. I. Rabukhov. *Liteinoe Proizvodstvo,* no. 5, May 1957, p. 14-15.

Description and the diagram of the apparatus; composition of the cast iron before and after the addition of manganese. Length of time of the process. (E22, W19m, 1-2; CI, *Mn*)

376-E. (Russian.) **Symmetry in Castings.** V. S. Kalabushkin. *Liteinoe Proizvodstvo,* no. 5, May 1957, p. 15-16.

Application of principles of symmetry to casting design. (E general, 17-1)

377-E. (Russian.) **Method of Fluidity Investigation.** A. M. Malachowski. *Liteinoe Proizvodstvo,* no. 5, May 1957, p. 16-17.

The investigation is divided into two parts: fluidity in castings of uniform and nonuniform cross section. Fluidity in the first group is determined by the height of the metal cylinders along the path of the flow. In the second group glass molds are used and the casting is examined directly. The fluidity does not depend on consistency but traces of water or paraffin adversely affect filling properties. Glass mold method enables determination of the minimum of the cross section area of the mold. (E25p)

378-E. (Russian.) **Influence of Coke Properties Upon Melting Process of Cast Iron in the Cupola.** A. N. Strukov. *Liteinoe Proizvodstvo,* no, 5, May 1957, p. 17-20.

Influence of coke fineness, mechanical strength and reactivity upon cupola process efficiency, metal overheating, and fuel efficiency. (E10a; CI, RM-j43)

379-E. (Russian.) **Casting Density and Structure Uniformity.** A. A. Ryzlkov. *Liteinoe Proizvodstvo,* no. 5, May 1957, p. 20-22.

Mechanism of secondary, coaxial shrinkage flaws and porosity. Experiments with a vibration casting method, whereby almost defect-free castings are obtained. 3 ref. (E25n, E25q; 9)

380-E. (Russian.) **Metal Testing.** V. P. Tshernobrovkin. *Liteinoe Proizvodstvo,* no. 5, May 1957, p. 22-25.

A method and apparatus for testing castings by investigation of cooling, shrinkage and resistance curves. 3 ref. (E25n, 1-3, 1-4)

381-E. (Swedish.) **How Casting Design Influences Pattern Costs.** Alrik Ostberg. *Gjuteriet,* v. 47, no. 6, June 1957, p. 95-98.

Pattern costs are an important part of the price of castings produced in limited numbers. How a suitable design can help to simplify the pattern equipment for machine molding is shown. (E17, 17-1, 17-3)

382-E. (Swedish.) **The CO_2-Method in the Production of Medium-Sized Iron Castings.** E. Sabel. *Gjuteriet,* v. 47, no. 6, July 1957, p. 99-102.

The price of CO_2-sand is about the same as that of the oil-sand method. The most important advantage of the method is that no drying of the mold and the cores is needed. The best results have been reached with a soluble waterglass with low Baumé used in a relatively high percentage. (E18n; CI)

383-E. (Book—German.) **Chill Casting: Practical and Theoretical Handbook.** 331 p. 1954 VEB Wilhelm Knapp Verlag, Halle (Saale), East Germany.

Theory of chill casting; chill casting products; use of pig iron and scrap iron; smelting furnaces; casting and teeming methods; die casting; chilled roll iron; "GWK — 100x" rolls; hot rolling; wire rolling. Bibliography. (E general; CI, 5-16)

384-E. The CO_2 Process of Producing Moulds and Cores. C. Sargent. *British Steelmaker,* v. 23, July 1957, p. 202-205.

Requirements, techniques and advantages of process in casting Ni-Cr alloy steels, ranging from 18-8 austenitic stainless to 60-20 Ni-Cr heat resistant steels. (E19, E21; SS)

385-E. Use of Sieve Analysis in Determining Surface Area of Sand. Robert E. Morey. *Foundry,* v. 85, Aug. 1957, p. 100-101.

Good approximation of surface area by formula involving grain fineness number, volume, density and surface shape factor. (E18r)

386-E. Patterns. Harry St. John. *Foundry,* v. 85, Aug. 1957, p. 105-107.

Techniques employed in patternmaking; materials for, and types of, patterns. (E17)

387-E. Air-Setting Process. Daniel R. Chester and William E. Mahoney. *Foundry,* v. 85, Aug. 1957, p. 110-113.

Theories, fundamentals, advantages, disadvantages of the process. (E18)

388-E. Steel Foundry Uses New CO_2 Gassing Techniques. D. C. Ekey and E. G. Vogel. *Foundry,* v. 85, Aug. 1957, p. 134-138.

To evaluate new vacuum chamber gassing machine tests were conducted to compare vacuum machine-gassed with hand-gassed cores for as-gassed early strength and standing strength to determine if a physical difference existed between cores vacuum machine-gassed in the box and those vacuum machine-gassed after stripping; and to determine effect of heated CO_2 on core quality and curing speed. (E21g; ST)

389-E. Reverse-Flow Heating in Core and Mold Ovens. Carl Mayer, Jr. *Foundry,* v. 85, Aug. 1957, p. 174-176.

"Reverse flow" heating can be done in two ways; preferred method is to discharge the hot air through headers in the roof over the load and recirculate it through a trench or pit in oven floor. (E21h)

390-E. Uses of Cast Iron and Other Materials as Denseners in the Production of Machine-Tool Castings. Brian Kirby. *Foundry Trade Journal,* v. 102, June 20, 1957, p. 749-754.

Effect on structure and hardness of using cast iron drills for rapid cooling of thick sections of iron castings; advantages of cast iron and silicon carbide compared as material for chill. (E22r; CI)

391-E. Pouring of Investment Castings. M. Riddihough. *Foundry Trade Journal,* v. 102, June 20, 1957, p. 761-762.

Furnace hearth shape, rate of pouring and design of investment mold are considered in the quality control of investment castings. (E15, E23)

392-E. Arc-Furnace Studies. *Foundry Trade Journal,* v. 103, July 25, 1957, p. 111-112.

Effects of power input on electricity consumption, melting time and electrode consumption. Rate of wear of firebrick and silica roofs. (E10r, 1-2; RM-h)

393-E. Vacuum Die Casting Processes. H. K. and L. C. Barton. *Machinery,* v. 91, July 26, 1957, p. 211-220.

Evacuation systems, including enclosure of whole die system; evacuation by way of ejector housings and use of hoods to enclose die and bolster. (E13, 1-23)

394-E. Design of Die Castings and Die-Casting Dies. Pt. 5. W. M. Halliday. *Machinery Lloyd,* v. 29, June 8, 1957, p. 70-74.

Considers fixed solid cores, movable cores, sprued channels and sprue dividers in die-casting die design. (E13, W19n, 17-1)

395-E. 17-4 PH Castings—Strong and Corrosion Resistant. David C. Ekey and E. V. Black. *Materials in Design Engineering,* v. 46, July 1957, p. 105-107.

Heat treatment, mechanical properties, design requirements to eliminate surface cracking in machining and welding. Frequency distribution and probability graphs of properties with relation to precipitation hardening. (E11, J general, Q general, R general; SS, 9-22)

396-E. Casting of Titanium May Be Possible Soon. *Materials in Design Engineering,* v. 46, July 1957, p. 166, 168. (CMA)

Research progress relating to melting furnaces, mold materials and casting alloys. Best molds now are obtained from graphite; mold life may extend to 50 castings if draft is adequate, re-entrant angles are absent and expendable inserts are used. Skull melting furnaces look promising. Superheating melts allows the gating system to be small. (E general; Ti)

397-E. Design of Die-Castings. H. K. Barton. *Metal Industry,* v. 91, July 19, 1957, p. 43-45.

Compares relative advantages of zinc, aluminum, magnesium and copper alloys as materials for pressure die castings. (To be concluded.) (E13, 17-1; Zn, Al, Mg, Cu)

398-E. Foundry Metallurgy. Alfred H. Hesse. *Metal Progress,* v. 72, Aug. 1957, p. 73-75.

American Foundrymen's Society hears that aluminum castings can be improved by sharply limiting the iron content. Die castings, vacuum melted, may compete with stampings. Graphite is, so far, the only practicable mold material for titanium. Tin (up to 0.10%) seems advantageous to gray iron—contrary to its popular reputation. Calcium is also the preferred element for inoculation of gray cast iron. (E general)

399-E. Die Casting Aluminum and Zinc. Pt. 2. *Modern Metals,* v. 13, July 1957, p. 74-84.

Zinc and aluminum alloy selection, alloying practices, melting and metal handling, remelting, scrap handling, foundry practices and inspection. (E13; Al, Zn)

400-E. Die Face Mould Coatings for Die Casting Dies. T. E. Murray. *Tooling and Production,* v. 23, Aug. 1957, p. 91-92.

Functions and requirements of lubricants and mold coatings for casting specific metals. (E13, W19n, 1-3; NM-h)

401-E. (French.) **30th Foundry Congress of the Association Technique de Fonderie at Paris.** *Métallurgie et la Construction Mécanique,* v. 89, July 1957, p. 633-641.

Abstracts of papers submitted on the following subjects; influence of the force of blast on the cupola operation; new recuperating plant for blast heating; modernization of foundries; the CO_2 process; aging of core sands; statistical control; causes and formation of pits; determination of feed cross-sections for moldings; spheroidal graphite cast irons; nonmagnetic cast iron; nickel-copper-chromium cast iron; graphitizing with salt baths; study of ingot molds. (E general; CI)

402-E. (German.) **Aluminium Pressure Die Castings for Internal Combustion Engines and Vehicles.** C. Bücken. *Aluminium,* v. 77, July 25, 1957, p. 525-536.

Special advantages of pressure-die castings in light metals; ease of shaping, satisfactory production conditions and high value of scrap; the present status of aluminum use in various vehicles; use of light-metal pressure die castings for cylinder blocks, engine housings, clutch and gear castings, pistons and cylinder heads. Many parts of the passenger car chassis bodywork and suspension can also be made of aluminum pressure die castings, such as wheels and hubs, parts of the brake equipment, fuel tanks, exhaust silencers, parts of the steering mechanism and door frames. (E13, W11j, 17-7; Al)

403-E. (German.) **Manufacture and Use of Large Aluminum Die Castings.** A. F. Bauer. *Giesserei,* v. 44, July 18, 1957, p. 421-437.

Rapid growth of aluminum die casting; development of large structural parts; new large die casting machines and automatic ladling devices; large die casting dies; design for large die castings; variables in aluminum die castings and their control; future prospects. (E13, 1-2; Al)

404-E. To Conduct Research in and Promote Development of Production of Titanium Alloy Castings for Ordnance Application. Final Technical Reports. Rem-Cru Titanium, Inc. (Watertown Arsenal Laboratory, Report 401/104-20.) *U. S. Office of Technical Services,* PB 127334, 44 p. (CMA)

Work discussed in three other reports summarized, covering construc-

tion of skull arc melting furnaces of the bottom-pour and tilt-pour designs, and the pouring and casting of titanium shapes and their as-cast properties. The castings were sound, strong, tough, good-surfaced and accurately dimensioned. Both machined graphite and carbon molds serve. Development of cheap molds of powdered carbon and graphite shows promise. (E10r, E23; Ti)

405-E. Continued Research and Development of Titanium Castings: Final Report. Rem-Cru Titanium, Inc. (Watertown Arsenal Laboratory, Report 401/208.) *U. S. Office of Technical Services,* PB 127336, 195 p. (CMA)

Melting and casting studies performed with Ti-7Al. Ti-7Mn and Ti-4Al-4Mn. Impact values versus tensile strength at 40 and 70° F. obtained. All castings had good chemical homogeneity.
(E general, Q general; Ti)

406-E. (French.) **Sulphur in Cast Irons.** Oliver Bader and Daniel Godot. *Fonderie,* no. 137, June 1957, p. 241-245.

Theoretical considerations on the chemical affinities of sulphur; morphology of its combinations and their influence on the constituents of cast iron; various methods of countering the action of sulphur by neutralization and by desulphurization process of producing a resistant iron with high sulphur content. 20 ref.
(E25; CI, *S*)

407-E. (French.) **Recent Progress in Sand Removal.** George Cros. *Fonderie,* no. 137, June 1957, p. 255-259.

Current processes and equipment employed in cleaning castings.
(E24)

408-E. (German.) **Tests on Sand Mixers and Centrifuges.** Waldemar Gesell. *Giesserei,* v. 44, July 4, 1957, p. 397-404.

Definition of "mixing"; classification of mixers; cooling effect of centrifuges; reducing the size of the sand grain. 9 ref. (E18p, 1-2)

409-E. (German.) **Results Obtained in the Operation of a New Mulling System for Preparing Foundry Molding Materials.** Theodor Klingenstein and Peter Pilz. *Giesserei,* v. 44, Aug. 1, 1957, p. 453-457.

The rotary muller; testing mulling efficiency; definition of the mulling quality; savings in binders.
(E18p, 1-2)

410-E. (German.) **A New Process of Chilling the Surfaces of Castings in the Mold.** Erwin Knipp. *Giesserei,* v. 44, Aug. 1, 1957, p. 467-469.

Chilling with chill-molds; chilling with link chains. (E22r)

411-E. (Italian.) **Mechanized Molding.** G. Somigli. *Fonderia Italiana,* v. 6, Mar. 1957, p. 97-105.

Technological developments during past decade, with detailed reference to modern equipment in Italian foundries. Sandslingers are widely used, receive special attention herein. Mechanized molding, to be worthwhile, requires mechanization and rational organization of other foundry operations.
(E19, 1-2, 18-24)

412-E. (Italian.) **Natural and Synthetic Clays and Sands.** E. Moltoni. *Fonderia Italiana,* v. 6, Mar. 1957, p. 106-110.

Developments during past ten years in control of sand and clay characteristics and properties. Discussion of core sands, zircon sands, CO_2 process, core ovens, both infrared and dielectric heating types.
(E18, E21h)

413-E. (Italian.) **Special Molding Processes.** V. Di Sambuy. *Fonderia Italiana,* v. 6, Mar. 1957, p. 119-120.

Capaco, Corning, Shaw, "Glascast", CO_2, "Accuracore", "Cermaform", lost wax, "Mercast", Metropolitan Vickers, Brake Shoe processes. (E16)

414-E. (Italian.) **Foundry Operations in a Naval Repair Yard.** Ernesto Bosio. *Fonderia Italiana,* v. 6, June 1957, p. 237-239.

Special problems of foundry work in a shop where deadlines, vessel safety and variety of jobs are controlling factors; methods adopted to expedite work.
(E general, T22, 18-22)

415-E. (Italian.) **Improvements in the CO_2 Process.** Paul Williame. *Fonderia Italiana,* v. 6, June 1957, p. 240-242.

Method of controlling metering of CO_2. (E18n)

416-E. (Japanese.) **Solidification Process of Magnesium Cast Iron.** Katsuya Ikawa. *Casting Institute of Japan, Journal,* v. 29, Apr. 1957, p. 213-214.

Graphite spheroidization process of magnesium treated cast iron.
(E25n; CI-r, *Mg*)

417-E. (Japanese.) **Tellurium Addition to Chilled Cast Iron.** Toshiaki

Ohmi. *Casting Institute of Japan, Journal,* v. 29, Apr. 1957, p. 214-215.

Surface hardening of tellurium cast iron; time and temperature effects; chill effect.
(E22r, 2-10, Cl, *Te*)

418-E. (Japanese.) **Study on Blowholes in Castings.** Hiroshi Yamaoka. *Casting Institute of Japan, Journal,* v. 29, Apr. 1957, p. 221-222.

Measurement of mold back-pressure and strength of solidified film on castings. (E25n; 9-18)

419-E. (Japanese.) **Causes of Scab. Report 3. When, Where and Why It Occurs.** Keizo Nishiyama. *Casting Institute of Japan, Journal,* v. 29, Apr. 1957, p. 222-227.

Relationship of casting temperature, casting speed, mold hardness and moisture of foundry sand to scab, rat-tail and veining formations. (E11, 9-21)

420-E. (Japanese.) **Study of High-Temperature Melting of Cast Iron. Report 3. Effect of Alkali Metal and Alkali Earth Metal Fluorides.** Takao Shibata. *Casting Institute of Japan, Journal,* v. 29, Apr. 1957, p. 227-228.

Alkali metals and alkali earth metal fluorides have stronger reduction properties than carbonates in molten iron; dissociation pressure, viscosity, moisture effect and reaction product resulting from the addition of metal fluorides at high temperatures. 3 ref. (E25n; CI)

421-E. (Japanese.) **Study of Metal Flow by Means of Colored Paraffin. Report 7.** Kenji Chijiwa. *Casting Institute of Japan, Journal,* v. 29, Apr. 1957, p. 228-229.

Metal flow studies in cylinders, plates and rings. (E25p)

422-E. (Japanese.) **Determination of the Melt Quality of 85-5-5-5 Red Brass.** Shigeo Oya. *Casting Institute of Japan, Journal,* v. 29, Apr. 1957, p. 230-231.

Effect of impurities (aluminum and silicon) examined by means of chilled test pieces. Charpy impact test was applied on test pieces to determine grain size.
(E25n, Q6, 3-19; Cu-n)

423-E. (Japanese.) **Structural Changes of Cast Iron in Vacuum Melting.** Reiichi Ohno. *Casting Institute of Japan, Journal,* v. 29, Apr. 1957, p. 236-237.

Reduction of oxygen, oxides and sulphur by vacuum melting; thermodynamic interpretation of the reduction; structure in relation to reduction of oxygen and sulphur.
(E10, 1-23; CI)

424-E. (Japanese.) **Structural Changes of Cast Iron, in Contact Melting With Various Oxides.** Reiichi Ohno. *Casting Institute of Japan, Journal,* v. 29, Apr. 1957, p. 237-238.

Molten steel and iron are mixed with oxides such as refractory materials and slags; effect on structure, graphite and sulphur studied.
(E25; CI)

425-E. (Japanese.) **Addition of Metals and Alloys for Spheroidal Cast Iron.** Takaji Kusakawa. *Casting Institute of Japan, Journal,* v. 29, Apr. 1957, p. 239-240.

Spheroidization of cast iron by the addition of magnesium, calcium and misch metal; experimental magnesium and magnesium alloys are most suitable.
(E25q; CI-r, AD-p36, *Mg, Ca,* EG-g)

426-E. (Japanese.) **Shape of Temper Carbon in White Cast Iron Made by Magnesium Addition.** Akio Sera. *Casting Institute of Japan, Journal,* v. 29, Apr. 1957, p. 240-241.

Change of graphite shape caused by the addition of magnesium, by varying the cooling rate and by different mold materials.
(E25q; CI-p, *Mg*)

427-E. (Japanese.) **Producing White Cast Iron by Gas Decarburization.** Isamu Takeda. *Casting Institute of Japan, Journal,* v. 29, Apr. 1957, p. 242-244.

Manufacture of white heart malleable cast iron with air or water vapor as the decarburizing agent; effect of temperature of air and water vapor and time of decarburization. (E11; CI-p)

428-E. (Japanese.) **Annealability of White Cast Iron.** Masayoshi Iwase. *Casting Institute of Japan, Journal,* v. 29, Apr. 1957, p. 244-246.

Manufacture of white cast iron; melting operation; effect of gas composition on graphitization.
(E11; CI-p)

429-E. (Japanese.) **Studies on Cupolas; Relation Between Flow of Wind and Chemical Reactions in Cupola.** Toru Ishino. *Casting Institute of Japan, Journal,* v. 29, Apr. 1957, p. 246-248.

Properties of coke and its chemical reactions; relation between wind

of flow and size of tuyére. (E10a; CI)

430-E. (Japanese.) **Study of High-Strength Cast Iron.** Kokichi Nakamura. *Casting Institute of Japan, Journal,* v. 29, Apr. 1957, p. 256-257.

By utilization of oxygen blowing, high-strength cast iron is obtained. This high quality is brought about by reduction of carbon and silicon. Relation between tensile strength, depth of chill, volume of oxygen blown studied. (E25; CI-c)

431-E. (Japanese.) **Study on the Mulling of Molding Sand. Report 3.** Saburo Katashima. *Casting Institute of Japan, Journal,* v. 29, Apr. 1957, p. 260-261.

Study of mulling time, size of sand, clay content. (E18p)

432-E. (Japanese.) **Sand Mold Binders. Reports 9 and 10.** Toshisada Makiguchi. *Casting Institute of Japan, Journal,* v. 29, Apr. 1957, p. 261-266.

Study of organic sand and clay mold binders, their chemical composition and thermal decomposition; effect of oxidation of binders on cast iron surface. (E18n)

433-E. (Japanese.) **Poval as a Foundry Sand Binder.** Ryojiro Kono. *Casting Institute of Japan, Journal,* v. 29, Apr. 1957, p. 266-267.

Pressure resistance properties of sand at various temperatures; characteristics of polyvinyl alcohol as a binder. (E18n)

434-E. (Japanese.) **Experiments on Dry Mold Sand for Steel Castings.** Hiroshi Akimoto. *Casting Institute of Japan, Journal,* v. 29, Apr. 1957, p. 267-268.

Effect on mold sand strength of addition of bentonite, percentage of water, time of mixing and sand size distribution. (E19b; ST)

435-E. (Japanese.) **Pinholes and Moisture Absorption of CO_2 Cores.** Shiosuke Sato. *Casting Institute of Japan, Journal,* v. 29, Apr. 1957, p. 269-272.

Absorption properties of cores in relation to pinhole formation during the casting. (E18n)

436-E. (Japanese.) **Research on the Hot Permeability of Molding Sand. Report 2.** Hiroshi Yamamoto. *Casting Institute of Japan, Journal,* v. 29, Apr. 1957, p. 273-274.

Diffusion of gas through molding sand, synthetic sands at different temperatures. 4 ref. (E18r)

437-E. (Japanese.) **Elevated Temperature Tests on Foundry Sands.** Yoshio Kuroda. *Casting Institute of Japan, Journal,* v. 29, Apr. 1957, p. 274-275.

Drawbacks of American Society for Testing Materials' elevated-temperature tests on foundry sand and suggested improvements. (E18r, 2-12)

438-E. (Japanese.) **Study of Molding Materials. Report 3 and 4.** Yoshiharu Isono. *Casting Institute of Japan, Journal,* v. 29, Apr. 1957, p. 275-278.

Influence of moisture and drying temperature on high-temperature properties of molding sands such as fluidity, moldability, heat transfer, permeability and strength. (E18r, 2-12)

439-E. (Japanese.) **High-Temperature Properties of Molding Materials. Pt. 2.** Kunio Futaki. *Casting Institute of Japan, Journal,* v. 29, Apr. 1957, p. 278-280.

Phenomena of expansion of the molding sand in contact with molten metal; relation between exposure time and expansion for different molding sands. (E18r, 2-12)

440-E. (Japanese.) **High-Temperature Properties of Molding Materials. Pt. 3. Effect of Binders.** Kunio Futaki. *Casting Institute of Japan, Journal,* v. 29, Apr. 1957, p. 280-282.

Binding materials studied were bentonite, dextrin, pitch and carbon black; strength of mold versus temperature investigated. (E18n, 2-12)

441-E. (Japanese.) **Heat Absorption of Mold and the Soundness of Casting. Report. 3.** Morio Takahashi. *Casting Institute of Japan, Journal,* v. 29, Apr. 1957, p. 287-289.

Shapes of pipes and process of pipe formation; mathematical conception of pipe formation. (E25n, 9-17)

442-E. (Japanese.) **Effect of Vibration During Solidification of Castings.** Hidesuke Niiyama. *Casting Institute of Japan, Journal,* v. 29, Apr. 1957, p. 289-291.

Study of solidification under effect of vibration for refining the crystal grain size and eliminating pinholes. It is suggested that strength of shock is a more important factor than vibration. 7 ref. (E25n, E25q)

443-E. (Japanese.) **Heat Transfer of Sand Molds—Influence of Binder.** Eiichi Matsumura. *Casting Institute of Japan, Journal,* v. 29, Apr. 1957, p. 291-292.

The heat conduction of molding sand at various temperatures and with different binding materials; heat conduction varies with water content and grain size of sand. (E18n, P11k)

444-E. (Japanese.) **Study on Blowholes in Castings. Report 2.** Hiroshi Yamaoka. *Casting Institute of Japan, Journal,* v. 29, Apr. 1957, p. 302-303.

Investigation of blowholes in relation to gas pressure in the shell molding process; blowholes versus thickness of shell mold; effect of the addition of resins. (E16c: 9-18)

445-E. (Japanese.) **CO_2 Molding Process. Report 2.** Niichi Minamimura. *Casting Institute of Japan, Journal,* v. 29, Apr. 1957, p. 303-304.

Experimental investigation of carbon dioxide efficiency; amount of carbon dioxide absorbed, amount dissipated in molding sand, amount necessary for binding the sand. (E18n)

446-E. (Japanese.) **Magnesium Addition in Making Spheroidal Cast Iron.** Kunio Okabayashi. *Casting Institute of Japan, Journal,* v. 29, Apr. 1957, p. 313-314.

The main effect of magnesium addition to cast iron is the promotion of spheroidal graphite; the mechanism causing the increase of spheroidal graphite. (E25q; CI-r, AD-p36, *Mg*)

447-E. (Japanese.) **Influence of Oxygen and Nitrogen in the First Stage Graphitization of White Cast Iron.** Taira Okamoto. *Casting Institute of Japan, Journal,* v. 29, Apr. 1957, p. 318-320.

Effect of red-lead, potassium ferrocyanide and aluminum on graphitization. (E25q, 2-10; CI-p)

448-E. (Japanese.) **Fundamental Experiments on the CO_2 Process.** Yasuji Kataura. *Casting Institute of Japan, Journal,* v. 29, Apr. 1957, p. 329-331.

Fundamental concept of the carbon dioxide process; strength of molding material and core at room temperature; permeability of carbon dioxide in molding sand. (E18)

449-E. (Japanese.) **Methods of Sand Analysis.** *Casting Institute of Japan, Journal,* v. 29, June 1957, p. 452-460.

Analysis by pressure, specific gravity and colorimetry, especially the use of nickel ion in colorimetry. (E18r)

450-E. (Russian.) **Study of the Durability of the Molds at the Kuznetsk Metallurgical Combine.** A. V. Plankina. *Stal',* v. 17, Apr. 1957, p. 362-365.

Slowing down mold cooling after casting proved to increase the durability; practice of using top-poured molds indicated that the application of the double-stopper pouring leads to lowering of the mold durability. (E19)

451-E. Aluminium Casting Alloys in Great Britain. F. H. Smith. *Castings,* v. 3, May 1957, p. 7-14.

Historical development of different aluminum casting alloys and beginning of official standards. 7 ref. (E general; Al)

452-E. Zircon Sand—A Valuable Foundry Tool. *Castings,* v. 3, June 1957, p. 7-9.

Compares physical properties of zircon and silica sand and suggests zircon mixtures for use in cores, green sand and dry sand molding. (E18r)

453-E. How to Use Olivine Sand. W. A. Snyder. *Foundry,* v. 85, Sept. 1957, p. 100-105.

Lower cleaning costs and reduced machining time result when used for manganese steel castings. Application and sand mixtures for molds, cores, ladle linings and washes. (E18; AY, *Mn*)

454-E. Testing Procedures in the Brass Foundry. Harry St. John. *Foundry,* v. 85, Sept. 1957, p. 116-119.

Day-to-day quality control: test bar method, fracture evaluation, Brinell testing and radiography. (E25, S13; Cu)

455-E. Hot Cracks and Tears in Malleable Iron Castings. R. W. Heine and F. W. Jacobs. *Foundry,* v. 85, Sept. 1957, p. 120-125.

Factors which when combined with normal contraction cause tears and cracks: feeding of the casting, stability of mold and molding sand, cores, casting design and miscellaneous causes. Classification and discussion of types of tears or cracks. 3 ref. (E25; CI-s, 9-22)

456-E. New Molding Process Makes Close-Tolerance Castings. James W. Hamblen. *Foundry,* v. 85, Sept. 1957, p. 138-139.

Carbon dioxide process is adapted to a semi-precision mold-making method, resulting in relatively thin molds comparable in dimensional accuracy and finish to shell molds. (E19)

457-E. **Wax Models for Use in the Investment-Casting Process.** E. H. G. Sargent. *Foundry Trade Journal,* v. 103, Aug. 1, 1957, p. 123-131.

Reviews waxes used from antiquity to present-day formulations; chemistry of waxes, additives, desirable physical properties, faults in wax patterns, recommendations for choosing wax for investment casting. 33 ref. (E15, NM-d32)

458-E. **Scandinavian Foundry Review.** *Foundry Trade Journal,* v. 103, Aug. 1, 1957, p. 133-139.

Processes and equipment used in two Danish iron foundries. (E11, 1-2; CI)

459-E. **Minutes From Melt to Mold.** Alan L. Colter. *Instrumentation,* v. 10, no. 4, July-Aug. 1957, p. 4-7.

Chevrolet Division's new foundry sets fast pace for production of engine castings; instruments help in cupola operation, sand and core drying. (E11, X general)

460-E. **Mold Treatment: the Key to Quality Castings.** Hubert Chappie. *Iron Age,* v. 180, Aug. 15, 1957, p. 98-101.

Emphasizes importance of careful drying, wash application, closing of cope and drag, pouring of molds for large steel castings. (E19; ST)

461-E. **Investment Casting Defects.** A. Hegarty. *Iron and Steel,* v. 30, Aug. 1957, p. 411-413, 418.

Causes and prevention of dip-coat spalling, dip-coat buckling, core shift, binder penetration, slag inclusions, scabbing, gas defects, oxide fold, shrink conditions, cold shut and mold crack. (E15, 9)

462-E. **Ethyl Silicate Moulds.** A. Torry. *Iron and Steel,* v. 30, Aug. 1957, p. 414-418.

Brief review of casting processes, with emphasis on "Truprocess" method of die preparation which incorporates the "Shaw" process of investment molding. (E15; ST)

463-E. **Molds for Titanium.** F. W. Wood and R. P. Adams. *Light Metal Age,* v. 15, Aug. 1957, p. 18-20.

Problems in titanium casting; use of water-cooled copper crucible and a water-cooled graphite crucible; lamination of molds to simplify machining and minimize breakage replacement. 4 ref. (E12, W18c, W19g, 1-2; Ti)

464-E. **Design of Die-Castings. Pt. 1. The Scope of the Die-Casting Process.** H. K. Barton. *Metal Industry,* v. 91, July 26, 1957, p. 67-68.

Relative strength of zinc, aluminum or magnesium-base die casting alloys and importance of this in die casting design. (E13, 17-1, Q27a; Zn, Al, Mg)

465-E. **Choosing Alloys for Die Casting.** W. Wolf. *Metal Treatment and Drop Forging,* v. 24, July 1957, p. 272-276.

Average composition and casting properties of tin, lead, zinc, aluminum, magnesium and copper die casting alloys and properties of interest to the user of die castings. (E13; Sn, Pb, Zn, Al, Mg, Cu)

466-E. **Development of Die Casting in Europe.** R. Lewis Stubbs. *Metal Treatment and Drop Forging,* v. 24, June 1957, p. 225-226, 253.

Historical development and current practices in production of zinc and aluminum alloy die casting in Europe. (To be continued.) (E13; Zn, Al)

467-E. **Rx. for Swollen Gray Iron Castings.** J. F. Wallace and E. B. Evans. *Modern Castings,* v. 32, Sept. 1957, p. 47-49.

Review of published information on cause of expansion, influence of various mold constituents and effect on mold cavity. Equation for determining volume change. 18 ref. (E25n, P10d; CI-n)

468-E. **How to Avoid Sand Segregation.** *Modern Castings,* v. 32, Sept. 1957, p. 50-51, 56.

Study by joint committee of National Industrial Sand Association on occurrence and recommendations to minimize segregation. (E18)

469-E. (French.) **Some Typical Defects of Aluminum Castings and Their Causes.** R. Irmann. *Fonderie Belge,* no. 4, Apr. 1957, p. 49-53.

Effects of gas contained in original metal, of absorption of gas during melting, inclusions of air and oxide films during pouring; phenomena of solidification. (E25n; Al, 9-19)

470-E. (French.) **Melting in the Crucible.** D. W. Brown. *Fonderie Belge,* no. 4, Apr. 1957, p. 55-63.

Reviews different types of melting furnaces; construction details and uses of crucible furnaces. Problems of preheating of supercharge; analysis of metal losses based on experimental work with variety of nonferrous metals and alloys.
(E10p, 1-2)

471-E. (French.) **Summary Address at Foundry Conference (June 7, 8, 9, 1956, at General Metallurgy Laboratory, University of Ghent).** A. De. Sy. *Fonderie Belge,* no. 4, Apr. 1957, p. 65-70.

Review of foundry melting processes. Cold blast cupola; characteristics and improvements; reversal of combustion gases, drying, super-oxygenization or preheating of combustive air. Silicon balance in hot blast cupola. Advantages of electric furnace melting. Melting of nonferrous metals. (E10)

472-E. (French.) **Conventional Pneumatic Molding Machines and Their Future in Mechanized Production.** R. Jacquemart. *Fonderie Belge,* no. 6, June, 1957, p. 125-131.

Types of machines, present field of use; flexibility of adaptation to various molding boxes; cost of installation (foundations, etc.), maintenance, accessories; possibilty of increasing productivity; mechanization; future of conventional machines as compared with other types of molding equipment. (E19, 1-2)

473-E. (French.) **Toward Automation in the Foundry.** W. Gesell. *Fonderie Belge,* no. 6, June 1957, p. 133-144.

Examination of possible extent of mechanization and automation in foundry operations. Description of actual mechanized installations of molding machines, melting equipment, sand apparatus. Prerequisites to introduction of automation in various departments are prior planning of automatic cycle, adaptation of equipment, production-line requirements, automatic controls.
(E general, 18-24)

474-E. (French.) **Molding by the Taccone Process.** M. Lepere. *Fonderie Belge,* no. 7-8, July-Aug. 1957, p. 159-163.

Principles and advantages of Taccone process; types of patterns that can be used; characteristics of sand to be used; precautions to take in construction of mold boxes; reduction in skilled labor requirements; maintenance of Taccone machine.
(E19, 1-2)

475-E. (French.) **Some Technical Aspects of Shell Molding: Possibilities of Hollow Cores.** Arthur Woods. *Fonderie Belge,* no. 7-8, July-Aug. 1957, p. 165-173, 202.

Design of pattern plates; cracking of shells; mold assembly; fabrication of cores by shell process.
(E19c)

476-E. (French.) **Cement Molding.** J. Zeiser. *Fonderie Belge,* no. 7-8, July-Aug. 1957, p. 181, 201.

Principle of cement molding process; characteristics of cement and of sand-cement mixtures; process details and pointers on sand preparation, patterns, molding, blackwashing, gas released during pouring. 16 ref. (E19, E18)

477-E. (French.) **Die Casting Magnesium Alloys. Die Casting Division of Foundry Industries Technical Center.** *Fonderie,* no. 138, July 1957, p. 322-324.

Die casting of magnesium alloys is very little practiced in France because of fears aroused by difficulties involved in affinity of magnesium for oxygen. Present summary, designed to show that accidents can be avoided, outlines process, briefly describes equipment used, from crucible to machining tooling, and stresses specific safety measures.
(E13, A7p; Mg)

478-E. (German.) **The Foundry Industry in Finland.** E. Autere. *Giesserei,* v. 44, Aug. 15, 1957, p. 485-490.

The metal industry; supply of metals and raw materials; pig iron, copper, coke and petroleum, electrical current, foundry sands, refractories and fluxes; the foundry industry; melting processes; description of some important foundries.
(E general)

479-E. (German.) **Active Dephosphorization or Denitration of Nodular Cast Iron.** Joseph Czikel. *Giessereitechnik,* v. 3, Mar. 1957, p. 52-54.

Active dephosphorization is possible with magnesium, calcuim and cerium when conditions are such that these elements will react with the iron phosphides in the melt to form phosphides of lower solubility at given temperatures. These phosphides precipitate and can be removed from the melt by washing or by gravity separation.
(E25; CI-r, *N, P*)

480-E. (German.) **Chill Casting of Nodular Iron.** Heinz Herbrich. *Giessereitechnik,* v. 3, Mar. 1957, p. 55-56.

It is shown that it is possible to chill-cast nodular iron, but since the casting cannot be worked or machined and cannot withstand dynamic stress, it has little use. However, after thermal treatment to the ferritic, ferritic-pearlitic, or pearlitic structure, the casting is usable for highly stressed machine parts. (E22r; CI-r)

481-E. (Italian.) **Use and Better Utilization of the Cupola.** Luciano Oltrasi. *Fonderia,* v. 6, June 1957, p. 247-259.

Historical summary of developments in design and characteristics of cupolas and charging methods. Combustion processes and reactions occurring in cold blast cupolas during melting. Methods of heating air for hot blast cupolas. Comparison of relative efficiency of hot and cold blast cupolas; basic process cupolas. Combination cupola-electric furnace melting systems. (E10a, 1-2; CI)

482-E. (Italian.) **Regeneration and Disintegration of Foundry Clays and Sands.** Ermes dall'Oglio and Francesco Carcano. *Fonderia,* v. 6, July 1957, p. 307-310.

Economies can be realized by suitable sand and clay recovery treatment. Methods and equipment. (E19s)

483-E. (Italian.) **Pre-Coated Sands for Shell Molding.** Rinaldo Cattaneo. *Fonderia,* v. 6, July 1957, p. 311-315.

Results of tests carried out to study influence of type of sand and particle size; how to counteract effect of solvents used in pre-coating with powdered resins; methods of pre-coating with liquid resins and mixed resins. (E19c; NM-h45)

484-E. (Japanese.) **Production of Heavy-Duty Cast Iron (Report 2). Melting of Heavy-Duty Cast Iron in Cupola.** Tadao Sato, Toshio Hirooka, Hideo Teramura, Tomohara Yoshikaur, Fumitaka Narita and Masatoshi Kikuchi. *Journal of Railway Engineering Research,* v. 14, June 15, 1957, p. 16-24.

Methods of production of heavy-duty cast iron by cupola. The following relationships were obtained: (1) temperature and coke ratio; (2) mechanical properties of the cast iron compared to oxidized cast iron. 6 ref. (E10a, Q general; CI)

485-E. (Russian.) **Use of Zirconium-Containing Sands in the Foundry.** L. Marienbakh and L. Sokolovskii. *Liteinoe Proizvodstvo,* no. 7, July 1957, p. 28-30. (CMA)

The demand for zirconium-containing sands is rapidly increasing, their principal uses being the production of refractories and forming of foundry molds. In the U.S.S.R. they are found in the Ural Mountains and in Southern European Russia. The principal zirconium minerals in the sands are zircon ($ZrSiO_4$) and baddeleyite (ZrO_2). In foundry practice the chief advantage of zirconium sands is the effective protection they afford the casting against the formation of thick crusts. 9 ref.
(E18, W19g; Zr, NM-f45)

486-E. **Use of Waterglass-Molding Sand Mixes Without Carbon Dioxide Hardening in Gray Iron and Steel Casting.** A. Gebauer and O. Gerstmann. *Giessereitechnik,* v. 3, no. 4, 1957, p. 73-77. (*Henry Brutcher Translation* no. 4008.)

Previously abstracted from original. See item 294-E, 1957.
(E18n, CI, ST, 5-10)

487-E. (Book.) **Solidification of Castings.** R. W. Ruddle. **406 p.** May 1957. Institute of Metals, 17 Belgrave Square, London, S.W.1. $6.50.

Solidification mechanism and rates. Lists high-temperature thermal properties of metals and mold materials; tables of two mathematical functions used in computing heat-flow rates. 306 ref. (E25n)

488-E. (Book.) **Magnesium Casting Technology.** A. W. Brace and F. A. Allen. 171 p. 1957. Reinhold Publishing Corp., 430 Park Ave., New York 22, N. Y. $4.95.

Magnesium casting alloys; melting practice; molding and core sands; running and gating systems for production of sand castings; production of pressure and gravity die castings; heat treatment practice; common defects of magnesium castings and inspection methods; surface treatment and application of castings. Both British and American materials and practices are considered. 154 ref. (E general; Mg)

489-E. **Advancements in the Investment Casting Process.** Kenneth Rose. *Automotive Industries,* v. 117, Aug. 15, 1957, p. 56-57, 117.

Casting of metals in a vacuum; use of special cores to make possible larger castings; use of ceramic shells for the molds to decrease the

amount of material handled in the foundry and improve accuracy of the castings. (E15, 1-23)

490-E. Ultra-Light Iron Castings for the Motor Industry. T. Wolverson. *British Foundryman,* v. 50, Aug. 1957, p. 395-399.

Molding practices in casting of automobile piston rings; methods for attainment of desired microstructure, molding practice and casting of valve tappets. (E19, T21b, 17-7; CI)

491-E. Aspects of the Feeding of Castings. B. J. Templar. *British Foundryman,* v. 50, Aug. 1957, p. 406-407.

Study of freezing of gunmetal gives information on thickness of castings which can be fed by 2-in. diameter feeders surrounded by exothermic material, plaster, sand or other heat insulating material. (E22, E25n; Cu)

492-E. Improvised Methods of Shell Molding. T. H. Weaver. *British Foundryman,* v. 50, Aug. 1957, p. 421-428.

Factors to consider before changing to shell molding. The production of shell cores and molds using improvised methods and equipment. (E19c)

493-E. Composite Castings of Aluminum Bronze and Steel. C. H. Meigh and G. E. E. Marshall. *British Petroleum Equipment News,* v. 6, Summer 1957, p. 36-38.

Development of composite castings, made by casting aluminum bronze on a steel core, enables the physical properties of the aluminum bronze to be combined with the relatively low cost of steel in the manufacture of a wide range of components. Features of the production method. (E general; Cu-s, *Al,* ST, 7-9)

494-E. Metallurgical Developments in Light Metal Piston Alloys. M. G. Neu. *Canadian Metalworking,* v. 20, Aug. 1957, p. 60-66.

Refined grain structure in aluminum alloy containing 20% silicon for use in automobile pistons procured by inoculation of melt with organic compound containing phosphorus. (E25q, T21b, 17-7; Al)

495-E. Kaolinitic Clays. *Castings,* v. 3, July 1957, p. 27-29.

Tests proved that kaolinitic clay mixes and sands bonded with kaolinite/bentonite mixtures have better foundry "life" properties than mixes bonded with bentonites alone. (E18p)

496-E. New Processes Used at New Investment Casting Foundry. Edwin Bremer. *Foundry,* v. 85, Oct. 1957, p. 95-97.

Investment mixing and melting employed at the Misco Precision Casting Co. in the manufacture of high-alloy vanes for aircraft jet engines. (E15; SGA-h)

497-E. Lightening the Atomic Cannon. G. D. Chandley and J. L. Belser. *Foundry,* v. 85, Oct. 1957, p. 100-103.

Report on Ordnance Corps sponsored research at the Watertown Arsenal. Tests were made on a 700-lb. aluminum bolster casting for 280-mm. atomic cannon to replace 1350-lb. steel weldment currently used. 3 ref. (E general, T1m, 17-7; Al)

498-E. Molding With CO_2. Leonard Romano and Anton Dorfmueller, Jr. *Foundry,* v. 85, Oct. 1957, p. 104-107.

Gassing techniques; mold washes; advantages at a molding medium; problems in using CO_2 sand. (E19)

499-E. IBF Annual Conference. *Foundry Trade Journal,* v. 103, Aug. 15, 1957, p. 183-188.

Abstracts of papers and discussion presented at Conference of the Institute of British Foundrymen. Points mentioned include water cooling; hot blast and oxygen enrichment of cupolas; production of iron alloy castings; carbon dioxide core processes; metal losses in crucible melting practices; melting and casting aluminum bronze; mold drying. (E general)

500-E. New Light Foundry at K & L. *Foundry Trade Journal,* v. 103, Aug. 15, 1957, p. 191-194.

Layout of sand plant, mold and core shop, melting and knock-out facilities of a new British steel foundry. (E general, W10, 1-2; ST)

501-E. Mossend and Hamilton Foundries of the Fullwood Company, Ltd. *Foundry Trade Journal,* v. 103, Aug. 29, 1957, p. 253-257.

Layout of these two Scottish foundries and the various services and processes utilized for economical production. The capacity of the Mossend foundry, when ingot molds up to 50 tons individual weight are made, is well over 1,000 tons per week. (E general, 18-17; ST)

502-E. Application of Sodium Silicate for Bonding Sands. F. W. Nield and D. Epstein. *Foundry Trade Journal,* v. 103, Sept. 5, 1957, p. 279-284.

Four sodium silicates, of SiO_2: Na_2O ratios; 2.0, 2.5, 2.9 and 3.3, were investigated and evaluated as bonding agents for a silica sand. The sand was produced by passing CO_2 through cylindrical standard test pieces and the relationship between compression strength and gassing time was established. 4 ref. (E18n)

503-E. The Manufacture and Application of Large Aluminium Pressure Die Castings. A. F. Bauer. *Machinery,* v. 91, Aug. 30, 1957, p. 491-502.

Recent progress; examples of components made by the process; machines and dies used for the castings; design of large dies and the materials employed; the design of large components for pressure die casting and the testing of large castings. (E13; A1)

504-E. 1958? Technical Advances Lead to New Uses, Lower Costs. *Precision Metal Molding,* v. 15, Sept. 1957, p. 60-61, 127.

Brief comments on new alloys, improved die materials, cast dies (Shaw Process), color anodizing, vacuum die casting. (E13, W19n, 1-2)

505-E. Casting Vs. Brazing of Wave Guides. K. L. Herrick and S. Lipson. *Precision Metal Molding,* v. 15, Sept. 1957, p. 70-71.

Advantages of investment casting; patten dies; wax injection and assembly; investing; casting; cleaning and finishing. Casting showed excellent electrical functioning. (E15, K8)

506-E. Faster CO_2 Cores. D. C. Ekey and E. G. Vogel. *Steel,* v. 141, Sept. 2, 1957, p. 150-156.

Multicycle vacuum gasser uses less carbon dioxide and hardens cores faster than gassing by hand. (E21g)

507-E. (English.) **The Foundry Industry in Sweden.** Lars Villner. *Gjuteriet,* v. 47, Aug. 1957, p. 137-145.

History, location, present numbers, productivity and types. Sweden, in 1956, produced 350,000 metric tons of gray iron castings, 34,000 tons steel castings, 18,000 malleable iron, 13,000 tons copper and 6,000 of light metal castings; foundry associations and organizations. (E general, A2, A4, A12g)

508-E. (English.) **Foundry Industry in Denmark.** Ove Hoff. *Gjuteriet,* v. 47, Aug. 1957, p. 146-147.

Briefly considers history, type and extent of foundry industry; production figures for 1956. (E general, A2, A4)

509-E. (English.) **Foundry Industry in Finland.** O. E. Huhtamo. *Gjuteriet,* v. 47, Aug. 1957, p. 148-151.

Development, locations, importance in economy and estimated foundry output. (E general, A4)

510-E. (English.) **The Foundry Industry in Norway.** Torolf Krogvig. *Gjuteriet,* v. 47, Aug. 1957, p. 152-156.

Development and history, present status, productivity, annual production and associations and organizations of Norwegian foundry industry. (E general, A2, A4, A12g)

511-E. (English.) **Water-Soluble Cellulose Ethers as Binders for Foundry Purposes.** Rolf Moren. *Gjuteriet,* v. 47, Aug. 1957, p. 157-165.

Data are given on baked transverse strength, green compressive strength, shatter index, gas content, collapsibility, and other properties of sand cores and molds bonded with cellulose ethers in combination with synthetic or natural resins or with cellulose ethers replacing cereal binders in oil-sand; comparison of properties of different cellulose ethers. (E18n)

512-E. (English.) **A Cost Comparison for Molten Iron From Induction Furnaces and Cupolas.** Mats Rydinger and Bertil Lundberg. *Gjuteriet,* v. 47, Aug. 1957, p. 173-178.

An attempt has been made to evaluate the melting cost in high-frequency and mains-frequency induction furnaces on the basis of operational data from several foundries. A comparison has been made between high-frequency, mains-frequency, cold-blast cupola and hot-blast cupola melting plants of the same capacity. (E10, 1-2, 17-3; CI)

513-E. (French.) **Use of Self-Drying Binders.** *Journal d'Informations Techniques des Industries de la Fonderie,* no. 8, Suppl., July 1957, 2 p.

Notes on use of oil-base binders in particular include practical suggestions on condition and types of sand to be used, sand preparation, how to use self-drying sand, core baking, advantages and disadvantages in use of such binders. (E18n)

514-E. (German.) **Seventy-Five Years of Iron Foundry Practice.** Hans Reininger. *Giesserei-Praxis,* v. 75, Aug. 10, 1957, p. 305-315.

Historical review of European foundries; methods, equipment, raw materials and products; development of current practice. 10 ref. (E general, A2; CI)

515-E. (German.) **Automation in the Foundry.** A. Hohmann. *Giesserei-Praxis,* v. 75, Aug. 10, 1957, p. 316-318.

Necessity of automation; advantages in time, labor and economy; examples in different phases of foundry work. (E general, 18-24)

516-E. (German.) **Use of Scrap in Cast Iron.** Hans Nordmann. *Giesserei-Praxis,* v. 75, Aug. 10, 1957, p. 322-324.

Importance of the use of the right kind and quantity of scrap; as a general rule only scrap similar in character to material being cast can be used; too much scrap lowers quality. (E general; CI, RM-p)

517-E. (German.) **Segregation Phenomena in Solidification of Metal Alloys.** Rudolph R. Domanowski. *Giesserei-Praxis,* v. 75, Aug. 10, 1957, p. 335-344.

Description of different irregularities based on foundry experience; causes, how to avoid defects and to reduce the uneven concentration of the metal particles. 8 ref. (E25n, 9-19)

518-E. (Italian.) **Foundry Mechanization for Non-Mass-Produced Castings. Technical and Economic Limits.** Nicola Monniello. *Fonderia Italiana,* v. 6, July 1957, p. 285-292.

Step by step examination of equipment, procedures and processes shows that with proper organization considerable mechanization can be achieved even where mass production is not involved, and that such mechanization is economically desirable and necessary. (E general, 18-24)

519-E. (Italian.) **Theory and Practice of Inoculation of Cast Iron.** Alfredo Secciani. *Ingegneria Meccanica,* v. 6, May 1957, p. 48-52.

Theory is advanced, on basis of fundamental structure of cast irons, that graphite is formed by "scission" from cementite. Practical standards for inoculation are suggested. 6 ref. (E25q; CI)

520-E. (Japanese.) **Malleable Iron for Export.** *Metals,* v. 27, Aug. 1957, p. 627-629.

Manufacture of malleable iron for the piston rings at Kumaya factory in Japan; the piston rings are exported to North and South America and Southern Asia. (E11, T21b, 17-7; CI-s)

521-E. (Portuguese.) **Foundry Sands Bonded by Sodium Silicate and Carbon Dioxide.** Victor Lo Re. *ABM, Associacao Brasileira de Metais, Boletim,* v. 13, Apr. 1957, p. 129-137.

Experiments were carried out to determine influence of humidity, length of mixing time, proportion of sodium silicate and duration of CO_2 injection on principal characteristics of test pieces. 7 ref. (E18n)

522-E. Protection and Preparation of Casting Surfaces. Van der Bruggen. *Foundry Trade Journal,* v. 103, Sept. 12, 1957, p. 315-318.

Nature and causes of surface contamination of remedial measures and various means of preventing initial corrosion. (E25, R general)

523-E. Speaking of Investments. H. J. Meerkamp van Embden. *Foundry Trade Journal,* v. 103, Sept. 19, 1957, p. 339-344.

Simple theories on the problems of the investing technique used to produce precision investment castings. Various methods including direct investment, the use of silica refractories and duplex treatments. (E15)

524-E. Effects of Vacuum Melting on the Growth of Gray Cast Iron. F. N. Tavadze and I. A. Bairamashvili. *Liteinoe Proizvodstvo,* no. 12, Dec. 1955, p. 23. (*Henry Brutcher Translation* no. 4038.)

Linear growth and scaling resistance of gray iron before vacuum melting or remelting, respectively, as function of time of holding at 730° C.; changes in microstructure after vacuum treatment. Evaluation of results with reference to the cause of the much smaller growth obtained after vacuum melting. (E25q, E10, 1-23; CI-n)

525-E. (French.) **Present Applications of the CO_2 Process.** Lev Petrzela. *Fonderie Belge,* Sept. 1957, p. 209-222.

Principle of chemical hardening of foundry sands; main types of chemically hardened materials; sand preparation; molding techniques, use of chemically hardened mixtures in steel, gray iron and malleable iron foundries; casting defects; regeneration of used sands, all with reference to Czechoslovakian practice. (E18)

526-E. (French.) **Characteristics of Core Sands.** Gabriel Joly. *Fonderie Belge,* Sept. 1957, p. 223-230.

Experimental study of sand characteristics, considered herein as most important factor in setting time for self-drying mixtures, led to two main conclusions: the higher the fineness index of sand, the greater the percentage of oil required; granulometric distribution and shape of grains are as important as fineness index in sand mixture. (E18p)

527-E. Which Core Process? *Australasian Manufacturer,* v. 42, Aug. 17, 1957, p. 56-60.

Advantages and disadvantages of conventional, shell, gas-setting and air-setting core processes. (E21)

528-E. Defects in Cast Iron for Enamelling Purposes. *Foundry Trade Journal,* v. 103, Sept. 26, 1957, p. 363-366.

Effect of casting quality on the vitreous enameling process. Some of the defects that influence the quality of the final coating, such as variation in wall thickness and structure, together with spalling and porosity. (E25, L27; CI)

529-E. Sealing Core Boxes Against Blow-By. Richard L. Olson. *Modern Castings,* v. 32, Oct. 1957, p. 41-52.

Possible solutions for the problem of erosion damage. Advantages of sealed core boxes include prolonged core box life, elimination of core box facing and repair and less mudding, patching and finning of cores. (E21)

530-E. Metallurgical Factors Affecting Locomotive Castings. W. Montgomery. *British Foundryman,* v. 50, Oct. 1957, p. 493-503.

Use of nondestructive testing in the investigation of flaws in steel castings; wearing properties of brake shoes and cylinder liners; reclamation of iron castings by means of welding; self-hardening core oil based on tung oil and its application to core production.
(E11, S13, A11d; ST)

531-E. A Simple Review of Iron Foundry Costing. G. B. Judd. *British Foundryman,* v. 50, Oct. 1957, p. 504-513.

Methods of estimating costs of patternmaking, molding, coremaking, fettling, cupola operation and defective castings.
(E general; A4s)

532-E. Mechanization of Gravity Dies. Douglas Miller. *British Foundryman,* v. 50, Oct. 1957, p. 513-516.

Various means of actuating gravity dies and the advantages and disadvantages of electrical, hydraulic and compressed-air systems. (E13)

533-E. Some Steelfoundry Mould and Core-Sand Mixes. R. M. Chapman. *Foundry Trade Journal,* v. 103, Oct. 3, 1957, p. 395-398.

Cold setting core-sand binders; effect of the partial substitution of Wyoming bentonite by kaolinite; use of resin core binders. (E18n; ST)

534-E. Tour of P. I. Castings (Altrincham), Ltd. D. H. Armitage. *Foundry Trade Journal,* v. 103, Oct. 3, 1957, p. 399-406.

Investment-casting processes, including pattern production, investment, pouring and dressing operations. (E15)

535-E. Refractory Chills — Experiments Carried Out at Carntyne Steel Castings, Ltd. A. Scott. *Foundry Trade Journal,* v. 103, Oct. 3, 1957, p. 407-408.

Physical and thermal methods of obviating hot tearing.
(E22r; ST, 5-10)

536-E. Malleable Production at the Nacton Foundry of Ransomes, Sims & Jefferies, Ltd. H. A. Wincer. *Foundry Trade Journal,* v. 103, Oct. 10, 1957, p. 423-431.

A step-by-step account of plant and equipment put to use by the firm for its initial venture into the production of malleable iron castings. (E11; CI-s)

537-E. Mechanization for Shell Moulding. *Foundry Trade Journal,* v. 103, Oct. 10, 1957, p. 433-437.

Progress made in South Africa in the development of the shell-molding process. (E16c, 18-24)

538-E. Inoculation of High-Strength Grey Cast Iron. N. C. McClure, A. U. Khan, D. D. McGrady and H. L. Womochel. *Foundry Trade Journal,* v. 103, Oct. 17, 1957, p. 453-460.

Series of experiments to determine the effect on mechanical and physical properties of gray cast iron when inoculated with silicon-containing alloys and other metals. Alloys and metals employed were ferrosilicon, calcium-silicon, manganese-zirconium-silicon and manganese-silicon with varying silicon contents. 3 ref. (E25q; CI-c, AD-p)

539-E. Railway Engineering Equipment. *Foundry Trade Journal,* v. 103, Oct. 17, 1957, p. 469-470.

Cast-steel bogies and automatic couplings at English Steel Castings Corp., Ltd.
(E general, T23s, 17-7; ST)

540-E. Meet the Electronic Sandman. J. R. Young. *Modern Castings,* v. 32, Nov. 1957, p. 36-37.

Automatic control of sand moisture gives Cadillac foundry closer control of variables. (E18)

541-E. Small Foundry Specializes and Grows. Don Volk. *Modern Castings,* v. 32, Nov. 1957, p. 38-40.

Equipment, layout and growth record of Alloy Steel Casting Co.
(E11, 1-2; AY)

542-E. Die Casting as It Is Being Applied and Developed in the Soviet Union. *Precision Metal Molding,* v. 15, Oct. 1957, p. 36.

Translation of a talk given at the Second International Die Casting Conference, recently held in Paris, by A. S. Ievsseiv, chief engineer, Foundry Section of the Institute of Research for the automobile industry. (E13)

543-E. Vacuum an Aid to Better Castings. Edward S. Czorniak. *Precision Metal Molding,* v. 15, Oct. 1957, p. 39-40, 65.

Universal Casting Corp. applies a vacuum to the mold cavity to produce close-grained, high-density castings free of porosity and inclusions. Unusual physical properties are attained without the sacrifice of intricate detail and close dimensional tolerances. (E19, 1-23)

544-E. Casting Big Engine Parts. *Precision Metal Molding,* v. 15, Nov. 1957, p. 44.

Large castings with complex coring can be cast by the permanent mold casting process. (E12; Al)

545-E. In Either Rain or Shine Die Castings Do the Job. Ralph Chappell. *Precision Metal Molding,* v. 15, Nov. 1957, p. 46.

Through the use of aluminum die castings low-priced instruments are now available for the amateur weatherman. (E13, X7, 17-7; Al)

546-E. Step Toward Automatic Die Casting. *Precision Metal Molding,* v. 15, Nov. 1957, p. 50-51.

With the development of an automatic transfer mechanism automation in the die casting foundry is one step closer. (E13, 18-24)

547-E. Heat Control of Investment Casting. S. C. Tingquist and William Cuddy. *Precision Metal Molding,* v. 15, Nov. 1957, p. 85-86.

Systems of temperature measurement and control for the more critical operations. (E15, S16)

548-E. Factors Affecting the Fluidity and Hot Cracking of Magnesium Alloys. H. F. Taylor and M. C. Flemings, Jr. Massachusetts Institute of Technology. (Wright Air Development Center.) *U. S. Office of Technical Services,* PB 131045, Jan. 1957, 93 p. $2.50.

Improvement of "castability" of magnesium alloys. A vacuum fluidity apparatus was used to determine fluidities of five alloys. Fluidity was determined as a function of temperature for each alloy, then fluidity at 1400° F. was plotted as a function of alloy content.
(E25p; Mg)

549-E. (German.) **A New Process for the Improvement of Cast Aluminum-Silicon Alloys.** G. N. Cherry. *Giesserei-Praxis,* v. 75, July 10, 1957, p. 263-266.

By addition of sodium to molten aluminum-silicon, its mechanical properties are greatly improved. Vacuum treatment has eliminated difficulties formerly caused by water absorption of sodium.
(E25, 1-23; Al, *Si*)

550-E. (German.) **Cement in the Foundry.** Karl Leisering. *Giesserei-Praxis,* v. 75, July 10, 1957, p. 266-267.

Cement used with small grain size sand results in great labor savings in molding due to easier insertion of cores. About three days must be allowed for setting of the cement in the mold before pouring.
(E19, E18)

551-E. (German.) **Hydraulic Operated Chill Molds.** Ernst Brunhuber. *Geisserei-Praxis,* v. 75, Aug. 10, 1957, p. 324-326.

Hydraulic equipment, operation; advantages in labor, costs and quality. Chill mold casting is now up-to-date and of increasing importance. (E22r, 1-2)

552-E. (German.) **New Technique in Aluminum Melting.** H. Kalpers. *Geisserei-Praxis,* v. 75, Aug. 10, 1957, p. 345-346.

The gases dissolved in molten aluminum can be removed by chlorination; however, this process has disadvantages. To minimize them a supplementary treatment using nitrogen is advised. 6 ref. (E25s; Al)

553-E. (German.) **Calculation of Buoyancy.** R. Springer-Donawitz. *Geisserei-Praxis,* v. 75, Aug. 25, 1957, p. 351-353.

Formulas for calculating the upward force exerted by the liquid metal in a mold. (E25, E19)

554-E. (German.) **The Malleable Iron Foundry of the Georg Fischer AG at Schaffausen.** Walter Götz. *Giesserei,* v. 44, Sept. 26, 1957, p. 564-579.

Compression of the mold; withdrawal operation; mold boxes; pattern board; placing the mold boxes on the mold conveyer belt and closing the mold; casting operation; loading the mold before and after casting. 9 ref. (E11; CI-s)

555-E. (German.) **Roller Conveyer Systems in the Molding Shop.** Werner Riege. *Giesserei,* v. 44, Sept. 26, 1957, p. 612-616.

Range of application and advantages of the roller conveyer; design of molding machines and layout of shops. (E19, 1-2, W12r, 18-17)

556-E. (Italian.) **Proportioning of Gas in the CO_2 Process.** Rinaldo Cattaneo. *Fonderia,* v. 6, Aug. 1957, p. 341-343.

Formulas for determining required amounts of gas; color-changing binders and physicochemical bases for their use; utility of mechanical metering devices. (E18)

557-E. (Italian.) **The Foundry at Compagnia Italiana Westinghouse, Turin.** *Fonderia,* v. 6, Aug. 1957, p. 357-360.

Description, including schematic drawing, of foundry considered one of most modern and efficient in Italy. Specializes in intricate castings for brakes and pneumatic equipment in general; monthly production is 250,000 kg. of iron castings. (E general; CI)

558-E. (Russian.) **Influence of Vacuum and Overheating Upon Cast Iron Structure.** I. E. Brainin and S. I. Shapovalov. *Fizika Metallov i Metallovedenie,* v. 4, no. 1, 1957, p. 115-122.

Overheating of the liquid cast iron, remelting under vacuum and reduction of sulphur contents favor decrease of graphitic inclusions due to increase of surface tension on interface of liquid metal-graphite. 7 ref. (E25q, E10, 1-23; CI)

559-E. (German.) **Aluminum Casting in Automobile Industry.** Gerhard Schnitzlein. *Kraftfahrzeugtechnik,* v. 7, Aug. 1957, p. 303-304.

Practical advantages and disadvantages of three casting methods in production of automobiles including engines; surface treatment, chromium and nickel plating of castings.
(E general, T21, 17-7; Al, *Cr, Ni*)

560-E. (Book.) **Cast Metals Handbook.** 320 p. American Foundrymen's Society, Golf and Wolf Rds., Des Plaines, Ill. $10.

Engineering reference book dealing with basic "know-how" in cast metals; working data for utilizing the properties of cast metals to the greatest engineering advantages.
(E general)

561-E. (Book.) **Design of Die Castings.** Gustav Lieby. 199 p. 1957. American Foundrymen's Society, Golf and Wolf Rds., Des Plaines, Ill. $8. (Translation from the German.)

Methods and processing principles; features of die-cast products; die-casting materials and applications; suggestions for die design.
(E13, 17-1; 5-11)

562-E. (Pamphlet.) **Investment Casting Engineering and Design Manual.** 50 p. 1957. Investment Casting Institute, 27 E. Monroe St., Chicago 3, Ill. $5.

Rules governing design; dimensional tolerances and shapes. Ferrous and nonferrous alloys recommended for the process. (E15, 17-1)

SECTION F

PRIMARY MECHANICAL WORKING

1-F. (French.) **Influence of the Furnace Atmosphere on the Calamine Formation in Billets.** J. Moreau. *Centre de Documentation Sidérurgique, Circulaire d'Informations Techniques,* v. 13, no. 10, 1956, p. 1973-1982.

Rough rolled and scraped billets of various steels were passed through furnaces differing in the heating method used. The conditions of heating, the superficial and internal formation of calamine and various problems were examined. (F21; ST)

2-F. (German.) **Production of Acid-Resisting Plated Sheet Steel.** Richard O'Donnel. *Neue Hütte,* v. 1, no. 8, Sept. 1956, p. 469-475.

Covers preparation and piling, preheating, roughing, intermediate rolldown and sheeting. (F21, F23; ST)

3-F. (German.) **Phenomena in Roll Gap and Their Influence on Roll Force and Torque in Hot Rolling.** Werner Lueg and Hans Günter Müller. *Stahl und Eisen,* v. 76, no. 21, Oct. 18, 1956, p. 1343-1356.

Speed of compression, deformation resistance, behavior of lever arm, pressure distribution, temperature. (F23)

4-F. **Effects of Screw and Speed-Setting Changes on Gauge Speed and Tension in Tandem Mills.** W. C. F. Hessenberg and W. N. Jenkins. *Institution of Mechanical Engineers, Proceedings,* v. 169, no. 52, 1955, p. 1051-1062.

Relates changes in interstand tension and finishing gage. Predicts behavior of tandem mills under various conditions. (F23, W22)

5-F. **Control Flatness of High Strength PH Sheet.** L. E. Laux. *Iron Age,* v. 178, Nov. 29, 1956, p. 84-86.

Tensile strength required of the heat treated 17-7 PH stainless steel sheet ranges from 180,000 to 210,000 psi. After this preliminary flattening, sheets undergo vapor degreasing first, then cleaning by the electro-alkaline process.
(F29s, L12j, L12k; SS, 4-3)

6-F. **A Mill for Cold Rolling Metals to Close Tolerances.** Michael G. Sendzimir and Ludwik Zdanowicz. *Iron and Steel Engineer,* v. 33, Nov. 1956, p. 65-70.

Mill is used for both ferrous and nonferrous metals where surface finish standards and tolerances are unusually rigid. Large reductions may be obtained in a single pass.
(F23, W22)

7-F. **Rolling Mills for Processing Nuclear Fuel Elements.** A. I. Nussbaum. *Iron and Steel Engineer,* v. 33, Nov. 1956, p. 93-103.

Fundamental design and operation, basic materials and their workability, glovebox enclosures, sequence of fabrication, reprocessing spent fuel. (F23, T11)

8-F. **Selection of a Lubricant for Cold Drawing. I. Coarse Steel Wire.** Bruce W. Siemon. **II. Fine Steel Wire.** W. B. Bauzenberger. *Iron and Steel Engineer,* v. 33, Nov. 1956, p. 105-108.

Applications of various types of lubricants. Speed and severity of drawing, material and desired product finish are factors influencing selection. (F28; NM-m, ST)

9-F. **Increased Heating Rates for Steel Ingots.** P. M. Cook and J. D. Stringer. *Iron and Steel Institute, Journal,* v. 184, Nov. 1956, p. 309-315.

Potential advantages of rapid heating are increased production from existing furnace capacity, reduction of scale losses and decarburization, and fuel economy. (F21b; ST, 5-9)

10-F. Extrusion of Metals. P. Feltham. *Metal Treatment and Drop Forging,* v. 23, Nov. 1956, p. 440-444.

Relations between extrusion force, ram velocity, friction at the billet container interface, and high-temperature rheological properties of metals are established and used to evaluate extrusion pressures for aluminum, copper, and lead.
(F24; Al, Cu, Pb)

11-F. We're Ready for Volume Business, Say Extruders of Titanium. *Steel,* v. 139, Dec. 10, 1956, p. 142-145.

U. S. extruders and what they are doing. Current extrusion practice with reference to temperature, lubricants, protection, roughness.
(F24; Ti)

12-F. Wire Flattening Practice. R. D. Weber. *Wire Industry,* v. 23, Nov. 1956, p. 1007, 1009-1012, 1030.

Wire flattening as a means of increased production, plant layout, production of transformer strip, cost data. (F29s; 4-11)

13-F. (German.) **The Load on a Three-High Finishing Stand and on Its Drive in Rolling Sheet, Bars, and Billets.** Werner Lueg and Hans-Gunter Muller. *Stahl und Eisen,* v. 76, no. 22, Nov. 1, 1956, p. 1457-1463.

Peaks of roll force and torque and their causes; distribution of the torque on the coupling spindles.
(F23, ST)

14-F. Great Falls Billet Plant. Roy H. Miller and L. J. Ingvalson. *Journal of Metals,* v. 8; *American Institute of Mining and Metallurgical Engineers, Transactions,* v. 206, Dec. 1956, p. 1661-1664.

Construction and operation of plant which produces 3-in. diameter billets with a high phosphorus content from cathode copper.
(F23, 18-19; Cu)

15-F. (German.) **The Problem of Load Distribution on Continuous Billet Rolling Mill Trains.** Werner Lueg and Hans Günt Müller. *Stahl und Eisen,* v. 76, no. 23, Nov. 15, 1956, p. 1562-1564.

Effects of longitudinal pull and pressure in the rolled product on the load absorbed in the stands.
(F23, 3-24; ST)

16-F. (Russian.) **Effect of Technological Factors of Rolling on the Quality of Bessemer Rails.** N. I. Beda, N. K. Borisenko, G. P. Kotov and E. M. Mal'tseva. *Stal',* v. 16, no. 10, Oct. 1956, p. 897-900.

Effect of the temperature of rolling, deformation of metal during blooming and condition of roll surface. Optimal soaking temperature of ingots. (F23, 2-11, F21b; ST)

17-F. (Russian.) **Effect of Sections and Temperature of Rolls on Weldability in Sheet Pack Rolling.** D. I. Suiarov and P. F. Zasukha. *Stal',* v. 16, no. 10, Oct. 1956, p. 901-904.

Optimum temperature of rolls and sheets to prevent welding of the latter during rolling.
(F23, 2-11; ST, 4-3)

18-F. (Russian.) **Manufacture of Seamless Thin-Wall Pipes of Large and Medium Diameters.** S. I. Borisov. *Stal',* v. 16, no. 10, Oct. 1956, p. 905-908.

Suggestions for improvements in manufacturing large pipes for the petroleum industry. (F26; ST)

19-F. (Russian.) **Rolling Square Steel Sections With Sharp Corners.** M. V. Shuralev and S. G. Nekrasov. *Stal',* v. 16, no. 11, Nov. 1956, p. 997-999.

A method was developed for accurate rolling of sections with sharp corners and flat faces. Discussion of changes made in equipment and rolling procedures. (F23; ST)

20-F. Hand Rolling, Good Scheduling Boosts Mill's Efficiency. W. G. Patton. *Iron Age,* v. 178, Dec. 27, 1956, p. 62-64.

Bar mill producing stainless items minimizes down time due to roll changes by careful scheduling and design. (F27; SS)

21-F. Rolling of Thin Strip, Part II. M. D. Stone. *Iron and Steel Engineer,* v. 33, No. 12, Dec. 1956, p. 55-76.

Pressure multiplication factor and rolling torque are expressed as a function of roll bite friction, flattened roll contact length and strip thickness being rolled. Nomograph for determining rolling pressures and powers. Power requirement per ton is expressed by work roll size, speed of rolling. (F23; 4-3)

22-F. Hot Extrusion of Carbon Steel Solid Sections. Joseph K. Seyler. *Iron and Steel Engineer,* v. 33, no. 12, Dec. 1956, p. 89-91.

Hot extrusion is a specialized tool, particularly suitable for small orders and complicated sections. (F24; CN)

23-F. Cause and Prevention of Hot Strip Work Roll Banding. Charles E. Peterson. *Iron and Steel Engineer,* v. 33, no. 12, Dec. 1956, p. 98-101.

Three practices suggested: remove all scale from strip before entering finishing stands; select a roll material combining high hardness with freedom from graphite; apply large

quantities of water at elevated temperatures to keep the rolls cold while rolling. (F23; 4-3)

24-F. Relative Value of Various Gases for Scarfing. W. M. Bloom. *Iron and Steel Engineer,* v. 33, no. 12, Dec. 1956, p. 141-147.

Factors include oxygen cost, flame propagation rates, operational man hours and maintenance. Acetylene was selected in the plant described. (F21e, RM-g33)

25-F. Cold Forged Superalloys. *Steel,* v. 139, Dec. 3, 1956, p. 126.

Variety of parts cold forged to close tolerances show high finish and excellent flow pattern. (F22, T7; SGA-h)

26-F. Rolling and Forging of Zirconium. R. S. Stewart and W. C. Greenleaf. Paper from "Zirconium—Technology and Economics". Atomic Industrial Forum, p. 19-23. (CMA)

Zirconium will be processed mainly on rugged, high-production steel mill equipment for some time, but this is satisfactory if operators are specially trained. Zirconium has a wide hot workability range. Quenching hardens but slightly. Descaling of tight oxide must be mechanical. The reduction of zirconium ingots to billets, slabs or bars is accomplished on heavy-duty forging hammers or presses; small ingots may be cogged on small blooming mills. Preheating, forging and post-annealing are discussed. Rolling operations and sizes and shapes of billets and bars are enumerated. Fabrication of cold-rolled strip on modern continuous strip mills is described. (F23, F22; Zr)

27-F. Drawing and Extrusion of Zirconium. R. S. French. Paper from "Zirconium — Technology and Economics". Atomic Industrial Forum, p. 25-27. (CMA)

After casting zirconium into billets, the usual method of hot breakdown into tubes is through extrusion, involving lamellar flow by means of a 45° cone placed before the die; 2200 and 2450-ton universal presses with 6-in. diameter liners are used. Billet preparation is needed. The slow operation of tube reducing follows extrusion. Cold drawing is used for finishing; essentials are good lubricant, a good undercoat and a reasonable drawing speed. Straightening is complicated by the stiffness of zirconium. (F24, G4; Zr)

28-F. Zirconium Products. E. A. Wright. Paper from "Zirconium—Technology and Economics". Atomic Industrial Forum, p. 95-99. (CMA)

Wolverine Tube Division of Calumet and Hecla, Inc., has pioneered in fabrication techniques for zirconium and zirconium alloys. The metal should not be extruded into tubes without first being jacketed in copper, red or yellow brass or Ti-namel steel; any surface alloy formed must be removed. Many sizes of zirconium billets have been extruded. Many problems must be solved before zirconium tubes can be formed by rotary piercing. Lubrication and annealing problems discussed. (F24, 4-10; Zr)

29-F. High-Speed Rolling Mill; Cold Rolling Tinplate Production at EBBW Vale. *Electrical Review,* v. 159, Dec. 14, 1956, p. 1083-1087.

Welsh mill rolls strip at 5000 ft. per min. Plant also contains a two-stand tandem temper mill capable of 4000 ft. per min. (F23, 1-17, W22; CN)

30-F. Rolling Mill Operation. Use of New Recording Techniques. E. A. Chard, W. W. Hastings, D. F. Nettell and A. M. Mech. *Iron and Steel,* v. 29, Dec. 8, 1956, p. 605-608.

Punched tape technique and analysis of tape; channel recorder technique, its apparatus and operational use; analysis of charts. (F23, X14)

31-F. Time Characteristics of the Slabbing Mill. H. G. Jones, D. T. Steer and P. D. Dickerson. *Iron and Steel,* v. 29, Dec. 8, 1956, p. 608-612.

Analysis of rolling components; time in contact with rolls; time out of rolls not tilting and with tilting; time to roll an ingot and influence of rolling speed. (F23, 4-2, 3-17)

32-F. Some Effects of Lubricants in Cold Rolling Thin Strip. J. C. Whetzel, Jr., and Charles Wyle. *Metal Progress,* v. 70, Dec. 1956, p. 73-76.

Maximum reduction of thin strip can be increased from 12 to 62% at the same rolling speed by changing the lubricant. (F23, 4-3; NM-h)

33-F. Magnetic Rolls Cut Crop Loss. *Steel,* v. 139, Dec. 17, 1956, p. 94.

Magnetic rolls position tubing for cropping. (F29p, W12; 4-10)

34-F. Forming Forum on Technical Progress. *Steel,* v. 140, Jan. 7, 1957, p. 366-372.

Fourteen of the industry's executives contribute to a symposium on progress. A few of the changes mentioned are growth of powder

metal industry, hot extrusion of finish products, improved lubrication for severe forming operations and more complex bending equipment.
(F general, G general, H general)

35-F. New Techniques and Equipment Permit Broader Applications of Rotary Swaging. Andrew E. Rylander. *Western Machinery and Steel World,* v. 47, Dec. 1956, p. 64-67.

Improvements include greater opening of dies permitting entry of bulbous parts, longer dies, use of four dies, and hydroform swaging. (F25)

36-F. (Russian.) **Investigating the Conditions of Titanium Alloy Rolling.** V. K. Belesevich, et al. *Izvestiva Akademii Nauk SSSR, Otdeleniye Tekhnicheskikh Nauk,* no. 10, Oct. 1956, p. 15-27.

Investigation of a two-component alloy of titanium with aluminum used in rolling sheet. The microstructure, gas saturation, plasticity, resistance to deformation during rolling, properties and the change in properties in relation to rolling temperature of the alloy are studied. (F23, M27, Q general; Ti, *Al*)

37-F. Wide Flange Beam Rolling at Inland Steel Co. W. E. Dittrich. *Iron and Steel Engineer,* v. 34, Jan. 1957, p. 67-75

Structural mill to roll both wide flange and conventional sections. The mill rolls wide flange beams from 8 x 5¼ in. to 24 x 9 in. Rolling rates of 778 tons per turn on 10 x 5¾ in. section attained.
(F23; ST, 4-7)

38-F. Steel Mill Drives—Past, Present and Future. R. H. Wright. *Iron and Steel Engineer,* v. 34, Jan. 1957, p. 76-81.

Progress of steel mill industry from 1907 and its probable future developments. Rolling mill drives are emphasized. (F23, W22, A2; ST)

39-F. Symposium on Titanium IV. Practical Problems Associated With the Control of Interstitials II. Control of Interstitials in Titanium Melting and Mill Processing. L. S. Busch. *Journal of Metals,* v. 9, Jan. 1957, p. 181. (CMA)

Heating titanium ingots in gas-fired furnaces, annealing or hot rolling, and chemical cleaning increase the hydrogen content with every operation; electric heating, though expensive, would be advantageous. Oxygen contamination is more serious, and the oxide scale must be removed by pickling.
(F21b, F23, 3-19; *Ti, O*)

40-F. Glass Baths for Heating Steel Extrusion Billets. Osvaldo Balestra. *Metal Progress,* v. 71, Jan. 1957, p. 109-112.

Considerable savings in fuel and maintenance cost have been realized by using a gas-fired molten glass bath instead of a salt bath for preheating steel extrusion billets.
(F21b, F24; NM-f42)

41-F. Advances in European Drop Forging. Tom Bishop. *Metal Progress.* v. 71, Jan. 1957, p. 113-115.

Industry-sponsored investigations of drop forging practice have resulted in increased die life and more efficient equipment. (F22n)

42-F. Heat Treating Practice in Russian Steel Mills. Lee Wilson. *Metal Progress,* v. 71, Jan. 1957, p. 116-121.

First-hand observations of Russian production equipment and techniques obtained during a visit to two steel mills during 1956.
(F general, D general, J23)

43-F. Shearing Squares up Billet Ends. W. C. Tucker. *Steel,* v. 140, Jan. 14, 1957. p. 75-76.

Need for billets that are square at both ends met by the use of confining shear. (F29q; ST, 4-2)

44-F. Fabrication of Molybdenum Sheet. J. R. Van Orsdel and R. B. Fischer. *U. S. Atomic Energy Commission, BMI*-1151, Dec. 5, 1956, 10 p. (CMA)

Fabricating molybdenum into 1/16-in. sheet with good ductility at 25° C. was studied; an unfibered grain structure was desired. The important variables are found to be the initial and final rolling temperatures, ingot thickness at the beginning of the finish-rolling step, reduction rate, and time and temperature of heat treatment. Wrought molybdenum sheet can be prepared without fibering and with adequate ductility; a small amount of residual cold work is needed and indicates the optimum recrystallization. (F23; Mo, 4-3)

45-F. Fabrication of Zirconium "S" Rod Thimble Tubes. R. M. Treco, G. T. Murray and R. S. French. *U. S. Atomic Energy Commission. BRB-1,* Jan. 1955, 71 p. (CMA)

A detailed procedure is presented for fabricating zirconium and Zircaloy-2 "S" rod thimble tubes for AEC purposes. Specifications are given. The procedure includes extru-

sion, tube working, welding and assembly. Twelve tubes meeting rigid specifications were fabricated for du Pont. (F24, K general; Zr, 4-10)

46-F. (German.) **Manufacture of Flat Wire.** A. Ball. *Draht,* v. 7, Dec. 1956. p. 459-464.

A thorough discussion of flat wire as a secondary product of the wire industry including general specifications, raw materials, cold rolling and maintenance of equipment, continuous rolling, coiling and uncoiling, arrangement of rollers, and production planning. (F28)

47-F. (German.) **Automation in the Cold Rolling Mill.** *Stahl und Eisen,* v. 76, Dec. 13, 1956, p. 1665-1668.

Variations in raw products, most reasonably priced materials, operation by common skilled laborers, and use of available equipment. The human element should be omitted to obtain increased efficiency with regard to strip velocity, gage and straightness. 5 ref. (F23, 1-17, 18-24)

48-F. (German.) **Testing Rolling Oil Emulsions by the Wire Drawing Test.** Werner Lueg and Winfrid Dahl. *Stahl und Eisen,* v. 76, Dec. 13, 1956, p. 1669-1671.

Wire drawing was not found to be the proper means of rating lubricating power of rolling oil emulsions. Comparisons are made with cold rolling tests. 5 ref. (F28, 1-4; NM-h)

49-F. (German.) **Effect of Finishing Operations on the Elastic Properties of Steel Wire.** Wilhelm Puengel. *Stahl und Eisen,* v. 76, Dec. 13, 1956, p. 1685-1689.

Effect of the preliminary and finishing straightening operation on the properties, particularly on the elastic properties of steel wire. Behavior of heat treated wire. Effect of the size of the coil. Subsequent treatment by prestressing. 7 ref. (F29r, G23q, Q21; ST, 4-11)

50-F. (German.) **Automation of a 12-Roller Reversing Cold Rolling Mill.** Herbert Schmale. *Stahl und Eisen,* v. 76, Dec. 13, 1956, p. 1698-1700.

A description of the mill; automatic thickness control brings about greater accuracy of gage; deviations in thickness of the complete strip are held to a minimum; dependence upon the reliability of the operator is negated; cost decreases achieved through use of fewer personnel. (F23, 1-17, S14, 18-24; ST)

51-F. (Russian.) **Study of the Conditions of Titanium Alloy Rolling.** V. K. Belosevich, V. F. Kalngin, N. I. Korneev, I. M. Pavlov, I. G. Skucharev and A. E. Shelest. *Akademiya Nauk S.S.S.R. Izvestiya. Otdelenie Tekhnicheskikh Nauk,* no. 10, 1956, p. 15-27. (CMA)

Experiments with a Ti-Al alloy used for sheet rolling demonstrated the advantage of rolling at a temperature above 1000° C. This finding was based on the following observations. Whereas below 950° C. the alloy has the structure of the α-phase, above 1000° C. the structure is that of the β-phase whose plasticity is higher than that of α. It should be borne in mind, however, that the absorption of gases is very intensive in the β region and that consequently, the heating should not be prolonged beyond the time necessary for reaching the desired temperature throughout the thickness of the metal. 7 ref. (F23, 2-11; Ti, 4-3)

52-F. Automation in the Drop Forging Industry. H. M. Fox. *Institution of Production Engineers Journal,* v. 35, Dec. 1956, p. 747-750.

Heating arrangements, other kinds of heating and heat treatment. (F22n, F21b, 18-24)

53-F. Stepped Extrusions. C. J. Hoffman. *Materials and Methods,* v. 45, Jan. 1957, p. 101-103.

New development of an aluminum extrusion having two or more different cross sections. (F24; Al)

54-F. Taper Heating of Aluminum Extrusion Billets. A. J. Mueller. *Metal Progress,* v. 71, Feb. 1957, p. 76-77.

During extrusion, the temperature of aluminum billets increases by as much as 150° F. To obtain uniform properties of the extrusion, the billet should be preheated with a temperature differential by a special three-section induction coil. (F24, F21b; Al)

55-F. Pieces by the Slice. *Steel,* v. 140, Feb. 4, 1957, p. 101-104.

Potential applications of extruded steels, with properties and size and shape limits. (F24, Q general; ST, 17-7)

56-F. The Present State of Scientific Knowledge in Hot Shaping or Forging. Eric Siebel. *Steel Processing,* v. 43, Jan. 1957, p. 19-24.

Elementary methods of hot shaping and the formulation of basic rules for shaping in the plastic

state. The formulas are explained according to the properties of the material, temperature, deformation rate and the degree of shaping. (F22, Q23q)

57-F. A Commercial Extrusion of Zircaloy-1. J. Halapatz. *U.S. Atomic Energy Commission WAPD-RM-189,* June 9, 1953, 14 p. (CMA)

Procedure for extruding Zircaloy-1 tubes from suitable sponge. Protective sheathing was unnecessary; the salt from the bath used to heat the billet served effectively as a lubricant. A re-evaluation of the Ugine-Sejournet process is urged. (F24; Zr)

58-F. Zircaloy Thimble for KAPL-120 Loop. G. C. Westfall. *U.S. Atomic Energy Commission KAPL-M-GOW-1,* Aug. 28, 1956, 19 p. (CMA)

Extrusion of heavy-walled Zircaloy tubing studied. An integral co-extruded hemispherical tip was specified. A Zircaloy thimble for a reactor is feasible, but design problems were encountered. The flux advantage over stainless steel is considerable. (F24, T11p; Zr)

59-F. Development of a Fabrication Procedure for Zircaloy-2. M. L. Picklesimer and G. M. Adamson. *U. S. Atomic Energy Commission CF-56-11-115,* Nov. 1956, 19 p. (CMA)

Heating Zircaloy-2 plate into the all-β field causes the disappearance of stringers which are evident after rolling the plate at 1550° F. Since stringers affect the properties of the notch-sensitive Zircaloy-2, a study of an alternative method of fabrication was conducted. The procedure developed consists of fabricating above 1780° F. or below 1490° F. and then heating to 1832° F. for 30 min., water quenching or air cooling, and then cold or "warm" rolling to 20% reduction. Annealing at 1472° F. for 15 to 30 min. follows. Another advantage is the decrease in preferred orientation. (F23, 1-16; Zr)

60-F. Bending by Rolling of Ferrous and Non-Ferrous Plate—3. E. L. Tinley. *Welding and Metal Fabrication,* v. 25, Feb. 1957, p. 66-67.

Practices in the elimination of flat ends; flexing roll machines; shipyard rolls. (F29r)

61-F. From Wire Rod to Wire Rope. *Wire Industry,* v. 24, Jan. 1957, p. 53-56.

Details of the drawing of wire and methods of construction of wire rope at the Martin Black and Co. (Wire Ropes) Ltd., Coatbridge, Lanarkshire, Scotland. (F28, K13s, T7g)

62-F. (French.) **The Manufacture of Monolithic Boiler Bodies in Forged Steel.** *Metallurgie et la Construction Mecanique,* Dec. 1956, p. 1017-1023.

Procedures employed in casting of ingots weighing as much as 270 tons and the production of boiler bodies forged in one piece. Methods of casting, cutting, core-drilling, tapping and cold working are discussed, together with the advantages gained from this technique. (F22, D9; ST)

63-F. Production of Stepped Aluminum Alloy Extrusions in the United States. *Engineer,* v. 203, Jan. 18, 1957, p. 114-115.

Equipment, finishing, properties and applications. (F24, 1-2; Al)

64-F. Non-Slip Point in Rolling. Z. Wusatowski. *Iron and Steel,* v. 30, Feb. 1957, p. 53-59.

The choice of correct equations for calculating the position of non-slip point in hot and cold rolling. The basic equations for the position of the angle of nonslip point have been obtained. 10 ref. (F23`

65-F. Stepped Aluminum Extrusions. C. J. Huffman. *Machine and Tool Blue Book,* Feb. 1957, p. 119-127.

Process, tolerances, finishing operations, machining, future uses. (F24; Al)

66-F. Carbide Cuts Extrusion Costs. *Steel,* v. 140, Feb. 25, 1957, p. 112-113.

Chromium carbide dies used for making extruded brass rods outlasted steel five times and are easier to clean. (F24, 1-2; Cu, Cr, 6-19)

67-F. (French.) **Drawing of Steel Wire With Glass as a Lubricant.** Georges Leclerc. *Revue Générale de Mécanique,* no. 95 (new series), Dec. 1956, p. 423-428.

Advantages of using extrusion presses rather than rolling mills in the drawing of steel wire; production of extrusion presses and their application in various industrial fields. (F28, F24; ST, NM-h)

68-F. The Effects of Lubricants on the Surface Appearance of Aluminum After Plastic Deformation. L. H. Butler. *Metallurgia,* v. 55, Feb. 1957, p. 63-66.

Effects of surface deterioration under various conditions on lubrication and results of tests of vari-

ation of viscosity of lubricants containing no additives on the surface condition of aluminum in compression.
(F general, G general; NM-h, Al)

69-F. Fuel Conservation in the Steel Industry. R. F. Perkins. *Research: Science and Its Application in Industry,* v. 10, Feb. 1957, p. 42-47.

Conservation in the steel industry, particularly with reference to casting bay and soaking pit practice. The courses of fuel losses are discussed, and details obtained in surveys of pit practice, and measurements made on 8 and 15-ton ingots are given.
(F21b, D9, A11; RM-j, RM-k, RM-m)

70-F. (Swedish.) **Inductive Block Heating With Current of Low Frequency.** Bo Estberger. *Teknisk Tidskrift,* v. 86, Dec. 4, 1956, p. 1059-1061.
Inductive heating of blocks for pressing cylinder blocks. The method could be used also for other purposes. (F21b, 1-19)

71-F. Production and Fabrication of New AISI Types 201 and 202. G. W. Hinkle. *ASTM Bulletin, No. 229,* Feb. 1957, p. 47-50.

Conversion of ingot to sheet and strip product is more time consuming. More power is required for hot and cold rolling. Annealing, pickling and cold rolling practices must be changed to produce commercial quality strip and sheet product; in deep drawing and spinning, changes must be made in tool design, power and blank size.
(F23, G4b, G13; SS)

72-F. Rolling With the Hot Planetary Mill. H. M. Walter. *Iron and Steel,* v. 30, Mar. 1957, p. 95-100.

Investigation using plasticine for study of material flow in planetary mill. Feeding speeds were varied and effect of roll size, slab thickness, temperature, slip forward or backward, angle of bite and scale distribution on material flow was recorded. (F23, W23)

73-F. Non-Slip Point in Rolling. Z. Wusatowski. *Iron and Steel,* v. 30, Mar. 1957, p. 109-111.

Comparison of experimental results obtained on cold or hot rolling of aluminum, copper or soft steel with the values for the angle of non-slip point calculated by seven methods from literature and by author's method. (Concluded.)
(F23; Al, Cu, CN)

74-F. Edge Position Control for the Steel Strip Industry. Frank J. Markey. *Iron and Steel Engineer,* v. 34, Feb. 1957, p. 119-131.

Design details of a continuous process line when edge control is applied to either the pay-off or wind-up reels, or at some intermediate point within the process.
(F23, X13; ST)

75-F. An Electrical Analogue for Estimating Die Temperatures During Wire Drawing. A. E. Ranger. *Iron and Steel Institute Journal,* v. 185, Mar. 1957, p. 383-388.

Temperatures of the outside of the die pellet were measured during wiredrawing and the temperatures of the interior surface of the die in contact with the wire were then computed by means of an electrical resistance network analogue of the thermal system. The most significant finding is that external cooling of the die is far less important than cooling its inlet, to prevent overheating of the soap powder before it enters the die. 6 ref. (F28, S16s)

76-F. Manufacture of Electrically Resistance Welded Steel Tube. W. G. Jones. *Australasian Engineer,* no. 44, Jan. 7, 1957, p. 63-66.

The strip is edge-trimmed, formed, welded, sized, straightened and cut off in a continuous process. The raw material is hot rolled or cold rolled strip. (F26p, K3; ST)

77-F. Wire Flattening. A. Ball. *Draht* (English Edition), no. 27, Feb. 1957, p. 11-16.

Specifications, raw material and considerations for rolling, including contact arc and drafting; spread, skidding, roll surface wear, examples of continuous rolling, rolling heat, rolling load, drive, guides, material take-off and production planning.
(F29s; ST, 4-11)

78-F. Preheating of Titanium. E. T. Adams. *Light Metals,* v. 20, Mar. 1957, p. 88-90. (CMA)

Furnace atmospheres for preheating titanium can contain some oxygen and nitrogen if the temperature does not exceed 800° C., since the diffusion rate is slow. Hydrogen diffuses rapidly but depends on the partial pressure, and under oxidizing conditions it absorbs slowly. The lowest temperature feasible should be used. Electric furnaces are preferred to gas or oil-fired fur-

naces but all may be preheated for hot working. (F21b, J2k; Ti)

79-F. (Portuguese.) **Basic Factors in the Problem of Rolling Steel in Latin America.** E. de Macedo Soares e Silva. *ABM, Bulletin of Brazilian Metals Society,* v. 12, Oct. 1956, p. 317-330.

Problems of design and installation of modern rolling equipment in integrated plants, in view of high productivity of blooming mills and continuous rolling mills. Suggests advisability, given rapid growth of markets, of making larger initial investments than absolutely necessary to permit future expansion. (F23, 1-2, 17-1; ST)

80-F. Induction Heating for Hot Pressing Non-Ferrous Metal Watch Cases. *Machinery,* v. 90, Mar. 22, 1957, p. 641-643.

Advantages of radio-frequency induction heating equipment for heating brass blanks prior to pressing. (F21b, J2g; Cu-n)

81-F. Hot Forged Parts. John L. Everhart. *Materials and Methods,* v. 45, Mar. 1957, p. 135-154.

Review of operations in the production of open and closed die forgings including information on forging design and tolerances to be expected. Numerous forged parts are used to illustrate forgings from iron, steel, aluminum, magnesium and titanium. (F22, 17-1, 17-5)

82-F. Hot Extrusion of Titanium and Titanium Alloys. A. M. Sabroff and P. D. Frost. Battelle Memorial Institute. *U.S. Office of Technical Services,* Report 53, PB 121621, Sept. 1956, 80 p. (CMA)

Results of a literature survey on the extrusion practices for titanium and its alloys. Requirements of the extrusions used by the aircraft industry. Problems in tooling, billet heating and lubrication. Mechanical properties of titanium extrusions. (F24, T24; Ti)

83-F. (German.) **General Conditions for the Compression Working of Titanium and Its Alloys.** Ig. M. Pawlow. *Berg- und Huettemaennische Monatshefte,* v. 101, Dec. 1956, p. 300-304. (CMA)

The characteristics of titanium and its alloys that have to be considered in compression working are the polymorphism of titanium (alpha and beta modifications) and its chemical activity at high temperatures (gas absorption, oxidation). General procedures for such operations as rolling and forming, based on these considerations, are discussed in some detail. (F general, G general; Ti)

84-F. (Italian.) **Considerations on the Use of Phosphatization in Tube Drawing.** Paolo de Cerma. *Rivista di Ingegneria,* v. 7, Jan. 1957, p. 11-12.

Examination of cycle of cold bonderizing using Societa Montecatini's F3A/F3B equipment. (F26r; NM-h)

85-F. Analysis of Die Profiles in Wire Drawing. L. W. Hu. *Franklin Institute Journal,* v. 263, Apr. 1957, p. 317-329.

Method for the stress analysis of wiredrawing using dies of any given profile. Examples of straight, concave, convex and bell-shape dies investigated. 10 ref. (F28, Q25, W23)

86-F. Effect of Critical Cold Reductions on the Structure and Magnetic Properties of Hot Rolled Transformer Sheet. B. Trakhtenberg. *Henry Brutcher Translation* no. 3838, 5 p. (From *Stal',* v. 16, no. 4, 1956, p. 343-347.) Henry Brutcher, Altadena, Calif.

Previously abstracted from original. See item 133-F, 1956. (F23, P15, P16, AY)

87-F. Effect of Surface-Active Lubricants Upon the Drawing of Metal Wire. V. D. Chistota, S. Ya. Veiler, V. I. Likhtman and P. A. Rebinder. *Henry Brutcher Translation* no. 3872, 4 p. (From *Doklady Akademii Nauk SSSR,* v. 110, no. 4, p. 562-565.) Henry Brutcher, Altadena, Calif.

Study of action of various lubricants on the cold drawing of steel wire. Correlation between number of carbon atoms in chain of lubricant and die pull. Effect of temperature (68 and 140° F.); soap solution (0.4%) as lubricant for prestrained wire. (F28, 2-11; NM-h)

88-F. (English.) **Steels for Large Forgings.** *Aciers Fins & Speciaux,* no. 25, Mar. 1957, p. 73-79.

Various operations and factors involved in the large forging technique, including details on the choice of steel and its manufacture. (F22; ST)

89-F. (Italian.) **Analysis of Deformation of Material During Wire Drawing.** Mario Lanfranco. *Ingegneria Meccanica,* v. 5, Dec. 1956, p. 33-42.

Deformation and stresses in cold plastic working in light of theories of elasticity and plasticity; applications to wiredrawing. Characteristic parameters in wiredrawing: coefficient of deformation and reduction of section. Forces and tensions present during stretching and deformation of fibers; diagram of tensions inside die; friction. 14 ref. (F28, Q24m)

90-F. (Portuguese.) **Problem of Rolling Steel in Latin America.** Edmundo de Macedo Soares e Silva. *Engenharia, Mineracao e Metalurgia,* v. 24, Dec. 1956, p. 353-355.

Geographical factors, raw material supply problems, personnel problems; existing equipment in mills in Brazil; flexibility and versatility requirements of equipment as conditioned by Latin American market; problem of labor force still in stage of acquiring experience. (F23, 1-2, A4; ST)

91-F. (Russian.) **Rolling and Heat Treatment of Titanium.** N. P. Zhetvin and V. K. Belosevich. *Tsvetnyye Metally,* Jan. 1957, p. 72-81.

Profiles may be rolled from a titanium-aluminum alloy without any particular difficulty. It is best to conduct finishing operations at 200-300° C. The hot rolling of sheets from commercial titanium and from a titanium-aluminum alloy is feasible up to a thickness of 2.0-2.4-mm. A forged sheet bar is used for the hot rolling of sheet and a forged bar for the rolling of sections. The rolling of sheets in piles is possible up to a thickness of 0.8-1.0 mm. but is not practical because of the considerable oxygenation and hydrogenation of the metal. The cold rolling of commercial titanium into sheets up to 0.8 mm. thick and strip up to 0.3 mm. thick is feasible. Commercial titanium should be annealed at 680-700°, while titanium-aluminum alloys should be annealed at 750-800°. Soaking time should be 4-5 min. per mm. thickness of the sheet or strip. (F23, J23; Ti)

92-F. (Swedish.) **Influence of Rolling Mill Spring on the Dimensions of the Rolled Product.** Hans Warrol. *Jernkontorets Annaler,* v. 141, no. 1, 1957, p. 28-36.

Theoretical investigation of the elastic deformation of the rolled material. Application in the design of roll stands. (F23, Q21, 1-2, 17-1)

93-F. **Back Extrusion of Heavy-Walled Zircaloy-2 Cups.** J. G. Goodwin and R. W. Tombaugh. *American Society of Mechanical Engineers,* Paper 57-S-15, Apr. 8, 1957, 22 p. (CMA)

The use of vertical and horizontal presses in back-extruding Zircaloy-2 cups was studied. In vertical presses, glass and copper were used as lubricants in back extrusion, and copper was used in impact extrusion. Satisfactory extruding temperatures of billets were 1800, 1600 and 1400° F., respectively. Impact extrusion of bare billets did not give good cups. In a horizontal press, thin copper-jacketed billets and billets coated with "Led-Plate" and MoS_2 gave satisfactory cups. Those from the latter billets were slightly inferior and required a 15% increase in extrusion pressure. (F24b, 1-3; Zr)

94-F. **How Tubemakers Work Zircaloy.** J. S. Rodgers. *Iron Age,* v. 179, May 23, 1957, p. 131-133. (CMA)

Despite the limited reduction per pass due to work hardenability, and despite the gas absorbability, Zircaloy tube production is commonplace. Extrusion practice of Wolverine Tube Co. includes precladding of billets with copper or copper alloy jackets, heating to 1350-1500° F. for 2-4 hr., and extruding in a 3000-ton press under 2500 psi. at a controlled rate. The tube hollow is provided by drilling a hole in the billet, which is also jacketed with copper. When the copper is pickled from the tubing, the latter is further reduced and drawn. A phosphate coat is used as a lubricant. (F24; Zr, 4-10)

95-F. **Department of Defense Titanium-Sheet Rolling Program, Status Report No. 1.** C. R. Simcoe. Battelle Memorial Institute, Titanium Metallurgical Laboratory Report 46A. *U.S. Office of Technical Services,* PB 121624, Mar. 1957. 48 p. (CMA)

The program is divided into three phases: study of process variables in melting and working, collection of design data, and evaluation of titanium sheet in the aircraft industry. (F23, T24, 17-7; Ti, 4-3)

96-F. (Portuguese.) **Continuous Cold Rolling of Steel Sheet.** Antonio Doria Machado. *ABM, Boletim da Associacao Brasileira de Metais,* v. 13, Jan. 1957, p. 5-40.

Review of forces that operate during rolling; process of cold rolling and importance of tensions, lubrication and cooling; finish rolling; defects most frequently occurring

in hot and cold rolling. 6 ref. (F23, 1-11, 1-17; ST, 4-3)

97-F. (Portuguese.) **Modern Methods of Manufacturing Steel Sheet.** Luiz Antonio de Arauio. *ABM, Boletim da Associacao Brasileira de Metals,* v. 13, Jan. 1957, p. 51-62.

Description of various processes, from manual to modern continuous rolling mills. Comparison of production obtained, space required for installations, capital investment, characteristics of different types of sheet. (F23, W23c, 1-2; ST)

98-F. Use of a Chip Method to Produce Homogeneous Aluminum-Uranium. W. L. Larson and J. L. Klein. Nuclear Metals, Inc. *U.S. Atomic Energy Commission,* NMI-1168, Dec. 27, 1956, 65 p.

Each ingot was machined completely into chips, and after being degreased, the chips were thoroughly mixed by tumbling. Chips were then cold compacted, canned, evacuated, hot compacted and hot extruded into a ⅛ x 1⅛-in. flat. The extruded flat was cold rolled to 0.015 ± 0.003 in. thick foil and milled to the proper width. Chemical analyses of the extruded flats and rolled foils showed that homogeneous foils were obtained. (F general; Al, U, 4-6)

99-F. (Italian.) **Stamping of Metals by Means of Hot Plastic Deformation. Pt. II.** Romeo Guisfredi. *Rivista di Meccanica,* no. 154, Feb. 2, 1957, p. 7-8.

Drop forging and free forging as types of hot plastic deformation; applications and equipment; limitations. (To be continued.) (F22, 1-2)

100-F. Reducing Smudge on Cold Rolled Sheet. Michael A. Matz. *Iron and Steel Engineer,* v. 34, Apr. 1957, p. 105-106.

Control and reduction of smudge conditions is not dependent on any one specific condition; variations in hot rolling, pickling and annealing practices may all affect appearance of smudge. (F23, 1-16; ST, 4-3)

101-F. Designing Steel Shapes for Hot Extrusion and Cold Drawing. R. L. Hugo. *Machine Design,* v. 29, May 16, 1957, p. 127-130.

Design criteria for hot extrusion and cold drawing; cost data for the designer. (F24, G4, 17-1; ST)

102-F. Latest Techniques for Extruding Aluminum. Charles W. Wick. *Machinery,* v. 63, May 1957, p. 143-147.

Processes and equipment for melting, semicontinuous ingot casting, ingot inspection and heat treatment, sawing into billets, billet heating and extrusion, extrusion finishing, heat treating and submerged ultrasonic testing at Kaiser Aluminum Halethorpe Plant. (To be continued.) (F24, C5, J general, S13g; Al)

103-F. Development Problems in the German Drop-Forging Industry. O. Niederhoff and F. D. Schieferdecker. *Metal Treatment and Drop Forging,* v. 24, May 1957, p. 187-198.

Adaptation of automation to the drop forging industry is handicapped by the high temperatures involved. Ways and means of overcoming difficulties suggested. (F22n, 18-24)

104-F. Prevention of Flakes in Semifinished Steels. L. A. Narutskaya. *Henry Brutcher Translation* No. 3908, 2 p. (From *Stal',* v. 16, no. 12, 1956, p. 1097-1098.) Henry Brutcher, Altadena, Calif.

Current practice of cooling billets of carbon and alloy steel in unfired pits with capacities of about 300 m. tons; best temperature at which the stock should be charged into the pits; precautions taken in rail mills to prevent flake formation. (F21; ST, 9-20)

105-F. (French.) **Surface Qualities of Thin Cold Rolled Sheets.** *Trempe,* no. 33, Apr. 1957, p. 36-50.

Various operations involved—scouring, cleaning, rolling, annealing, skin passing, surface finishing. (F23, 1-17, L10, L12, J23; 4-3)

106-F. Tube-Forming. *Aircraft Production,* v. 19, May 1957, p. 174-179.

The production of the core-tubes for hollow steel airscrew blades as a multistage cold drawing operation from a precision turned billet. (F26r; ST)

107-F. Sprayed Lubricant Speeds Forging. *Modern Industrial Press,* v. 19, May 1957, p. 21-22.

Spraying hot die lubricant Thermex 33 between strokes resulted in longer die life and less scrap in hot press forging of roller rim from SAE 1045 steel. (F22; NM-h)

108-F. (French.) **Manufacture of Steel Wire and Wire Working. Pt. II. Steel Wire Working.** R. Ducharne and J. Moreau. *Pratique des Industries Mecaniques,* v. 40, Feb. 1957, p. 29-40.

Wire products have great variety of shapes, some of which require

very complicated machinery to manufacture; such equipment cannot be described because it is in realm of manufacturing secrets. This article therefore deals with basic processes and methods of making wire products. (F28, G general)

109-F. Reheating of Steel Without Scale. A. G. Robiette. *Iron and Coal Trades Review,* v. 174, Apr. 19, 1957, p. 903-910.

Partial combustion of fuel gas with oxygen using products to preheat both air and charges; furnace design. (F21b, W20h, 1-2; ST, 9-2)

110-F. Automatic Processes in Strip Rolling. S. S. Carlisle. *Metal Industry,* v. 90, May 3, 1957, p. 350-354.

Recent research and development relating to automatic gage control with particular reference to system of control called "Translator", for use in hot and cold steel strip tandem mills and on single stand and tandem cold mills; while the "gagemeter" determines actual gage in roll gap from measurement of screw settings plus mill housing stretch, the "Translator" used in connection with "gagemeter" offers method of automatic control. (To be concluded.) 7 ref.
(F23, 1-2, X20c; ST, 4-3)

111-F. Titanium Extrusions. A. M. Sabroff and P. D. Frost. *Modern Metals,* v. 13, June 1957, p. 50, 52, 54, 56, 58. (CMA)

Titanium extrusions were recently used in jet engines for such parts as nonrotating spacers, rings and flanges. It is estimated that the future aircraft requirement for extrusions will amount to 15-20% of the total titanium required. A tabulated summary is given of development work on the extrusion of several titanium alloys by 12 firms. Processes using glass were used by the majority, but grease and copper jacket processes were used by some. The basic extrusion method is forward extrusion in horizontal hydraulic presses. Short heavy-walled tubes may be back extruded in vertical hydraulic presses. The extrusion temperatures vary from 1500° F. (for Ti-2.2Fe-2.1Cr-2Mo) to 1900° F. (for Ti-5Al-2.5Sn). Various greases and glasses are considered.
(F24, T24, 17-7; Ti)

112-F. Guide for Forging Stainless. W. E. McFee. *Steel,* v. 140, Apr. 15, 1957, p. 150-152.

Preheat and forging temperatures, soaking times and cooling methods for chromium-nickel, martensitic chromium and ferritic chromium steel forgings. (F22; SS)

113-F. Uranium Alloys: Their Preparation and Fabrication as Zircaloy-Clad Fuel Rods. W. B. Haynes. *U.S. Atomic Energy Commission,* WAPD-133, Jan. 10, 1956, 45 p. (CMA)

Among the alloys successfully duplex-melted were U-Mo and U-Mo-Pt. They were co-extruded in Zircaloy-2, cold drawn and swaged. Micrographs are shown for fuel rods before and after cold working. Alloys with 10.5-12% Mo are harder to extrude and draw than the analogous columbium alloys. A waterglass coat baked on the Zircaloy-2 reduces the alloying between the copper jacket and the Zircaloy cup during extrusion.
(F24, T11g, 17-7; U, *Mo, Zr,* 8-16)

114-F. Extrusion Techniques and Billet Design for the Production of Zircaloy-2 Clad Uranium-12 w/o Molybdenum Fuel Rods. J. G. Goodwin, et al. *U.S. Atomic Energy Commission,* WAPD-135. Jan. 10, 1956, 33 p. (CMA)

Fuel rods of 12% Mo-U alloy were prepared with Zircaloy-2 cladding. The fabrication of the extrusion billets is described. The best rods were prepared by heating the billets in a chloride salt bath at 1635° F. before extrusion. Dispersion of MoS_2 in Led-Plate is a good extrusion lubricant. The extruded rods were dejacketed, cold drawn and etched to size.
(F24, T11g, 17-7; U, *Mo, Zr,* 8-16)

115-F. Fabrication of Experimental U-Mo Fuel Rods by the Drawing of Co-Extruded Round Rods. H. J. Snyder. *U.S. Atomic Energy Commission,* WAPD-T-283, Oct. 13, 1955. 18 p. (CMA)

The fabrication of 12% Mo-U fuel rods with Zircaloy cladding is described. Co-extruded round rods may be either cold or hot drawn to reductions of 53 and 77% respectively. Better yields would result from proper tooling and longer rounds. MoS_2 in lacquer is a good lubricant for cold drawing and a mixture of sodium chloride and graphite in oil is good in hot drawing.
(F27, T11g, 17-7; U, *Mo, Zr,* 8-16)

116-F. (French.) Technological Aspect of Shaping by Cold Deformation of Metal. Raoul Molle. *Metallurgie et la Construction Mecanique,* v. 89, May 1957, p. 451-457.

Factors involved in the various methods of cold deformation of metal must be studied at the level of the crystalline network. Description of the various physical tests of the metal; special study of some deformation processes; cold shaping by rolling; sheet metal working. (To be continued.)
(F23, 1-16, G general)

117-F. Cooling of Hot Steel Strip With Water Jets. A. Sigalla. *Iron and Steel Institute, Journal,* v. 186, May 1957, p. 90-93.

Two series of experiments have been undertaken on the cooling of hot steel strip, and their relevance to the design of strip cooling systems is discussed. It was found that rapid cooling can be achieved using simple water jets, and a formula is given from which the approximate number required can be calculated. 11 ref.
(F23; ST, 4-3)

118-F. Modern Techniques in the Cold Reduction of Sheet and Tin Plate. E. N. Archibald. *Iron and Steel Engineer,* v. 34, May 1957, p. 141-146.

Operation of five-stand tandem, four-high cold reduction mill for production of steel sheet and plate; example of screwdown and tension adjustment and control; note on rolling lubricant, automatic ultrasonic testing for defects, screwdown and radioactive radiation thickness gages.
(F23, 1-17, W23c, 1-2; ST, *Sn*)

119-F. Latest Techniques in Extruding Aluminum. Charles H. Wick. *Machinery,* v. 63, June 1957, p. 166-170.

Extrusion on 2750-ton capacity oil-hydraulic presses at Kaiser.
(F24, 1-2; Al)

120-F. Titanium Tubing. T. M. Krebs. *Metal Progress,* v. 72, July 1957, p. 82-87. (CMA)

Seamless titanium tubing is available in a wide range of sizes in A-40, A-55 or A-70 grades with extruded and ground or machined surfaces or cold finished. Welded and cold finished tubing is also available. Alloy tubing may be obtained in the extruded and heat treated condition. The outstanding resistance of titanium to many cnemicals, such as chlorides, indicates a large future use in the chemical and process industries.
(F24, F26, T general; Ti, 4-10)

121-F. Steel and Titanium Extrusions. F. T. Roberts, Jr. *Society of Automotive Engineers, Journal,* v. 65, June 1957, p. 75-77. (CMA)

Titanium and steel alloys are now being extruded on a production basis for aircraft. Titanium extrusions are found in the McDonnell F-101 and in North American missiles. The configurations are usually angles, H's, tees and similar simple designs, and lengths up to 20 ft. have been formed. Shorter lengths are preferred because contact with the die surface should be minimized to keep the tool from overheating. The area of cross section and the gross weight are functions of the length and the weight of metal in the billet. Butt discard and front and rear-end scrap must be considered. Most common and exploratory alloys of titanium may be extruded, but optimum fabricating practices must be established for the higher alloys. Unusual shapes are expected in the future.
(F24; ST, Ti)

122-F. Lubrication: A Study of Its Actions in Continuous Metal Deformation. Pt. II. L. H. Butler. *Steel Processing,* v. 43, June 1957, p. 326-333.

Bulk plastic deformation with no lubricant or very thin films, discontinuous films and continuous films. The establishment, maintenance and limitations of lubricant films.
(F general, G general, 18-23)

123-F. (German.) **Graphic Representation of the Drawing Process on Non-slip Multiple Wire Drawing Machines.** F. Kowalski. *Draht,* v. 8, Mar. 1957, p. 77-80.

Mathematical calculations and graphic representation of various factors involved in the use of multiple wiredrawing equipment.
(F28, 1-2)

124-F. (German.) **Fabrication of Bright-Drawn Steel Bars in the United States.** Otto Andrieu. *Stahl und Eisen,* v. 77, June 27, 1957, p. 853-859.

Plant size, batch size and flow of work; machinery and work processes; conclusions to be drawn for German bright-drawing plants.
(F27, 1-2; ST)

125-F. (German.) **Temperature Measurements in the Drawing of Steel Wire. Pt. II.** Werner Lueg and Karl-Heinz Treptow. *Stahl und Eisen,* v. 77, June 27, 1957, p. 859-867.

Test results obtained up to present; materials tested, testing equip-

ment and execution of the tests; effect of the lubricant carriers and lubricants on the temperature; application of the temperature as related to the friction surface; change of the temperature with the length of the wire drawn; effect of carbon content, tensile strength and drawing rate on the temperature in the draw-hole. (F28, S16)

126-F. (German.) **Investigations on a Four-Cylinder Reversing Mill Stand for Cold Rolling Strip for Tinplate. Pt. I. Measurements to Determine the Power and Work Required and the Degree of Utilization.** Karl-Heinz Spiller. *Stahl und Eisen,* v. 77, June 27, 1957, p. 867-874.

Measurements carried out on reversing mill stands to increase their efficiency. Testing equipment, execution of the tests and their interpretation; materials tested; evaluation of the values recorded; mean rolling conditions as dependent on the material and on the number of passes; utilization of the current of the motors; load imposed on the Ward-Leonard converter and rolling work required; effect of the measurements on the improvement of the efficiency.
(F23, W23c, 1-2; ST, *Sn*)

127-F. (German.) **Investigations on a Four-Cylinder Reversing Mill Stand for Cold Rolling Strip for Tinplate. Pt. II. Effect of the Rolling Force, Rolling Speed, Strip Tension and Amount of Lubricant Used on the Accuracy in Dimensions of the Cold-Rolled Strip.** Paul Funke. *Stahl und Eisen,* v. 77, June 27, 1957, p. 874-881.

Testing scheme for measuring the effect of different conditions of rolling on the strip thickness; materials tested and testing equipment; test results; effect of the rolling force, rolling speed, braking tension and the tension of the reel, as well as of the distribution of the lubricant on the thickness of the strip. (F23, W23c, 1-2; ST, *Sn*)

128-F. (German.) **How to Determine Forging and Finishing Periods.** Hans Haller. *Werkstatt und Betrieb,* v. 90, Apr. 1957, p. 227-232.

From the procedure and sequence of operations in hot working, the necessary work expenditure and its associated time for forging and upsetting are determined. Influence of form changing resistance, temperature, form changing speed and friction resistance are particularly considered. The fundamental forging period is deduced from the necessary work expenditure and the available efficiency of the hammer or press. (F22, 3-17)

129-F. Extrusion of Steel Using Glass as a Lubricant. Pt. 1. History and Theoretical Principles. *Iron and Coal Trades Review,* v. 174, May 24, 1957, p. 1193-1197.

Basic principles, advantages and applications of the steel extrusion process; operating procedures; selection of lubricant. Results of research undertaken by Jacques Sejournet at the Acieries Electriques d'Ugine. (F24; ST, NM-h)

130-F. Titanium Extrusion. Pt. 2. A. M. Sabroff and P. D. Frost. *Modern Metals,* v. 13, July 1957, p. 52-54, 56, 60, 62, 64. (CMA)

Either cast or forged billets of titanium are satisfactory for extrusion. A smooth finish and an outer edge that has been chamfered or radiused are recommended. In heating, the billets should be kept scale-free, for example by immersion in a salt bath. The advantages of induction heating are enumerated. Post extrusion processing is discussed. (F24, F21b; Ti)

131-F. Many Applications for "Tube-in-Strip". *Pipes and Pipelines,* v. 1, May 1957, p. 23-24.

New mill product in the form of a single strip, or sheet, of solid copper, brass or aluminum in which tubes are inflated to desired running lengths in a variety of shapes and sizes. (F26; Cu, Al)

132-F. Principles of a Metallurgically and Physically Balanced Hot Strip Mill. M. Alexander Leishman. *Proceedings of the 64th General Meeting of the Iron and Steel Institute,* 1956, p. 151-170.

Analysis of components of rolling system of hot strip mill established relationships between some of the following factors: temperature of furnace soaking zone, rolling time and roughing, entry temperature into strip mill, finishing speed, gage, finishing temperature and length of coil. Enables optimum coil length and weights to be calculated for metallurgically balanced operations. (F23; ST, 4-3)

133-F. Steelwork by Automation. *Scope,* v. 5, May 1957, p. 40-45.

Application of transfer techniques to the production of structural steel

at Sanders and Forster Ltd., Stratford, England. (F27, 18-24; ST)

134-F. (German.) **Nomographs for Drawing Power and Power Requirements for Wiredrawing.** *Draht,* v. 8, June 1957, p. 203-208.

Detailed calculations and straight line charts for wire drawing. 5 ref. (F28)

135-F. Evaluation of Tests for Forgeability. Alan B. Draper. *ASTM Bulletin,* no. 223, July 1957, p. 62-68.

Defines components of forgeability as flow stress, ductility, external frictional resistance and range of temperatures and speeds; surveys conventional tests for evaluating forgeability including flow stress by compression, ductility by compression, friction and its determination, tension, bend, torsion tests and special forgeability tests. 35 ref. (F22, 17-2, 1-4)

136-F. Swaging. Metal Turning Supplement. *Automatic Machining,* v. 18, July 1957, p. 31-35.

Typical swaged parts illustrate advantages of hot and cold swaging for production of some pieces; work hardening effect of swaging on high-alloy and carbon steels, copper and aluminum. (F25; CN, AY, Cu, Al)

137-F. High Temperature Steel Mill Greases. John Simon. *Iron and Steel Engineer,* v. 34, June 1957, p. 93-103.

Performance requirements, properties and characteristics of high-temperature greases. Few lubricants are compounded specifically for high-temperature service. (F general; NM-h, 2-12)

138-F. Titanium—Production and Use. V. W. Whitmer. *Iron and Steel Engineer,* v. 34, July 1957, p. 130-132. (CMA)

Problems associated with the forging and rolling of titanium ingots. Turning requires surface removal up to ½ in. more, and may be supplemented by spot grinding. (F22, F23; Ti)

139-F. Cold Extrusion of Steel. Ben Kaul. *Machinery,* v. 63, Aug. 1957, p. 176-184.

Both backward and forward cold extruded techniques are illustrated by procedure in extruding a pressure tube from 1012 hot rolled steel bar; press, annealing and cleaning operations. (F24, 1-17; ST)

140-F. Theory of Rolling. Hugh Ford. *Metallurgical Reviews,* v. 2, 1957, p. 1-28.

Theory of cold rolling, starting from von Karman equation; development of theory from other assumptions and illustration of theory in relation to hot rolling. 74 ref. (F23, 1-17, 10-1)

141-F. Lubrication. A Study of Its Action in Continuous Metal Deformation Pt. 3. L. H. Butler. *Steel Processing and Conversion,* v. 43, July 1957, p. 387-395.

Determination of coefficient of friction in rolling processes and its relation to lubricant with special reference to rolling of aluminum alloys; effect of lubricant on staining of aluminum strip during annealing; pick-up of roll coating and effect on surface finish of product in hot rolling of aluminum; mechanism of action in hot rolling. 13 ref. (F23, Q9p; Al, NM-h)

142-F. (French and German.) **Problems Involved in the Manufacture of Aluminum Foil.** H. P. Grauer. *Aluminium Suisse,* v. 7, May 1957, p. 83-85.

Review of current methods of production. (F23; Al, 4-6)

143-F. Influence of Forging Temperature on Mechanical Properties of Al-V Titanium Alloys. L. S. Croan and F. J. Rizzitano. Watertown Arsenal Laboratory, Report 401/268. *U. S. Office of Technical Services,* PB 131118, Feb. 1957, 28 p. (CMA)

Mechanical property changes with forging temperature were studied for Ti-6Al-4V and Ti-7Al-4V. A production technique was developed involving press forging from above the beta transus and water quenching from the press. Toughness (impact resistance) may increase 50% without reducing strength. Improved forgeability is combined with reduced cost. (F22, 17-2; Ti)

144-F. Factors Affecting the Swelling of Steel Bars on Cold Drawing. A. I. Kukhorev. *Stal',* v. 16, no. 2, 1956, p. 181-182. (*Henry Brutcher Translation* no. 3881.)

Significance of carbon content of steel for amount of swell in cold drawn bar stock; relation between elastic strain in cold drawing and steel composition, bar diameter, amount of cold reduction and drawing speed. (F27, 1-17; ST)

145-F. Ways of Minimizing Edge Cracks in Rolling of Electrical Sheet. N. F. Dubrov. *Metallurg,* v. 1, no. 12, 1956, p. 23-24. (*Henry Brutcher Translation* no. 4019.)

Difficulties encountered in rolling of dynamo steel with increased silicon content and a 0.20-0.25% addition of aluminum to lower the watt losses. Measures adopted to minimize edge cracks; lowering the sulphur content; increasing the manganese content; lowering the ingot temperature prior to rolling.
(F23, 9-22, 2-10; ST, SGA-r, 4-3)

146-F. (French.) **Straightening of Sheet, Structural Iron, Pipe and Profiles by Shrink-Heating.** André Heydacker. *Revue Generale de Mecanique,* v. 41, Feb. 1957, p. 49-52.

Straightening of metal construction elements deformed during fabrication or work handling is usually done by forging methods. It is possible to replace these conventional methods with localized heating by means of a blow torch of appropriate size. (To be continued.)
(F29r)

147-F. (Polish.) **Factors Influencing the Behavior of Certain Grades of Austenitic and Ferritic Steels on Hot, Plastic Deformation.** Edward Terlecki. *Hutnik,* v. 24, June 1957, p. 222-227.

Types of cracks in high-alloy, corrosion-resistant steels; hot, plastic deformation; causes of the cracking and remedies. (F general; SS, 9-22)

148-F. (Polish.) **Internal Cracking in Ingots and Blooms on Rolling.** Jozef Gorecki. *Hutnik,* v. 24, June 1957, p. 228-234.

Causes of internal cracking of ingots and blooms on rolling; influence of the initial height, pressure and diameter of the roll; breaking strain in the area of pressure; depth of penetration of the pressure effects; prevention of internal cracking. (F23; ST, 9-22)

149-F. (Russian.) **Production of Cold Rolled Transformer Steel.** A. I. Belakov. *Metallurg,* v. 2, No. 5, May 1957, p. 22-24.

Seven steps are recommended: hot rolling, annealing, etching, first cold rolling, intermediate annealing, second cold rolling and high-temperature annealing.
(F23, 1-17, J23; ST, SGA-q)

150-F. (Russian.) **Thin Sheet Rolling Mill.** A. A. Nefedov and G. Z. Shtcherbina. *Metallurg,* v. 2, June 1957, p. 23-25.

Introduction of convex rolls, strict control of heat to insure uniform temperature of the metal and gas-air ratio of 1:3.66 to 1:3.76 are factors increasing the efficiency of the mill by 40 to 70%. (F23; W23c, 1-2)

151-F. (Russian.) **Modernization of Certain Units of the Slabbing Mill.** B. M. Tsirlin. *Stal',* v. 17, Mar. 1957, p. 232-238.

Partial modernization of 1000-mm. slabbing mill equipment (roll tables, bearings, scale and scrap removal) has increased mill productivity 32% and reduced considerably idle time. Completion of the planned modernization will more than double the mill capacity in comparison with 1953. (F23n, W23a, 1-2)

152-F. (Russian.) **Multiple Cold Drawing of Tubes With Application of Phosphatizing Bath.** M. S. Goncharevsky, F. A. Danilov, S. S. Shaikevich and P. K. Stasevich. *Stal',* v. 17, Mar. 1957, p. 243-253.

The multiple cold drawing of tubes with the phosphate bath has a number of technical and economic advantages, improving the deformation process, raising productivity of the equipment, and saving fuel, metal and tools. 12 ref.
(F26r, 1-17; NM-h)

153-F. (Russian.) **A Rail Ingot of 9.75 Tons.** M. T. Bulsky, F. F. Sviridenko, A. G. Alimov and O. V. Dolinenko. *Stal',* v. 17, Apr. 1957, p. 305-310.

The history of one of the largest rail steel ingots from the Azovsteel blooming mills is given. Satisfaction is expressed with the quality of the metal of finished product and mechanical properties.
(F23; ST, 5-9)

154-F. (Russian.) **Economic Use of the 450 Mm. Strip Rolling Mill for Producing Plowshares.** L. N. Soroko and M. L. Mirenskii. *Stal',* v. 17, Apr. 1957, p. 329-332.

Possibility of using automatic machines in treatment of strip steel. The practice at the Kuznetsk Metallurgical Combine in producing a profile for 149D plows.
(F23, G general; ST, 4-3)

155-F. (Russian.) **Consideration of Mechanical Marking of Blooms and Slabs.** I. S. Pobedin and I. F. Prikhodko. *Stal',* v. 17, Apr. 1957, p. 333-340.

Mechanism for making billets after the pass through the cogging mill, located on the roll table beyond the shears. The billets are stamped without stopping the metal; a device mechanically changes the stamp. (F29, X6p, 1-2)

156-F. (Russian.) **Technique for Rolling Tubes From Ingots.** V. V. Shveikin and L. N. Karpenko. *Stal',* v. 17, Apr. 1957, p. 340-342.

At the Cheliabinsk Tube Plant improvement in rolling tubes was achieved by using polyhedral ingots in place of round ones, by use of a new double-bevel grooving of the piercing mill rolls and employment of a new mandrel. (F26s; ST)

157-F. (Russian.) **Area Reduction Coefficient of Forgings of Disk-Shape.** I. G. Generson. *Vestnik Mashinostroenia,* v. 37, Jan. 1957, p. 49-55.

The value of height reduction coefficient is well established, being about 2-3. The same value for area reduction is less well established but is usually 2.5 to 3. The results of eight experiments are summarized and photographs of microstructure reproduced. (F22, 17-2)

158-F. (Russian.) **Speed of Deformation on Forging and Hot Stamping.** D. I. Berezovski. *Vestnik Mashinostroenia,* v. 37, Mar. 1957, p. 63-66.

Speed of deformation of ingots or billets on forging is responsible for discrepancies between computed and actual values for specific pressure and force of the hammer or the press. Formula for speed of deformation on forging, stamping and drawing in relation to the force and specific pressure. Formulas for the speed of deformation of the billets on hydraulic, steam-hydraulic forging and stamping, pneumatic and steam-pneumatic hammering and hot stamping. 9 ref. (F22, 3-17)

159-F. Seamless Tube Giant Producing at Sault Ste. Marie. *Canadian Metalworking,* v. 20, July 1957, p. 46-49.

Forming of seamless steel tubing from 4½ to 10¾ in. o.d. in new Canadian mill. (F26, 1-2; ST)

160-F. Pipe Manufacture and Use. P. D. Thomas. *Iron and Steel Engineer,* v. 34, July 1957, p. 84-87.

Butt welding, lap welding, rotary piercing, electric welding, gas welding and extrusion methods applied to meet demand for oil, gas, water, construction and mechanical uses for tubes and pipes of carbon, alloy and stainless steel, aluminum, copper, titanium and other nonferrous metals. (F26, T26r, 17-7; CN, AY, SS, Al, Cu, Ti)

161-F. Cold Extrusion of Steel on Verson Presses. *Machinery,* v. 91, July 12, 1957, p. 90-94.

Advantages of components produced by cold extrusion of steel illustrated by numerous extruded parts. (F24, 1-17; ST)

162-F. Developments in Aluminium Extrusion Techniques. *Machinery,* v. 91, Aug. 9, 1957, p. 309-313.

Facilities and techniques at Halethorpe plant for casting aluminum ingots, cutting into billets, billet heating and extrusion of variety of shapes in lengths up to 100 ft. Production of hollow extrusions and other special shapes; heat treatment and inspection. (F24; Al)

163-F. How Rolled Magnesium Sheet and Plate Is Produced. *Magnesium,* Aug. 1957, p. 10-15.

Procedure in melting, fluxing, alloying, casting slabs and ingots, nature of deformation during rolling, hot rolling operations; arrangement of roll and roll material; lubricant heating methods; types of rolling mills, annealing, cold rolling, roller levelling; thermal flattening. (F23, C5; Mg, 4-3)

164-F. Electrical Equipment for a Cold Cut-Up Line. *Metallurgia,* v. 56, Aug. 1957, p. 57-60.

Cut-up line now in commission at the Abbey works of the Steel Co. of Wales is designed to cut strip from 15-ton coils into lengths ranging from 4 to 36 ft., and to flatten and pile the cut lengths. Both automatic and manual control is possible and the maximum speed of operation when cutting ⅜-in. steel is 150 ft. per min., rising to 250 ft. per min. for 3/16-in. steel. (F29q; ST, 4-3)

165-F. When to Use Cold Extrusion for Steel Parts. Charles B. Grace. *Product Engineering,* v. 28, p. 145-147.

Description of process and use in designing shafts, cylinders and other parts of similar shape. (F24, T7; ST)

166-F. Steel and Titanium Extrusions. F. T. Roberts, Jr. *SAE Journal,* v. 65, June 1957, p. 75-77.

Applications in aircraft; advancements and future possibilities. (F24, 17-7; ST, Ti)

167-F. (French.) **Contribution to the Study of Rolling Equipment. Sect. C. Malleability and Flow of Metal During Hot Rolling.** (Continued.) G. Grenier. *Echo des Mines et de la*

Metallurgie, no. 3504, May 1957, p. 275-281.

Blooming of ingots; rolling of plate from blooms, of angle-iron, girders, U-iron, rail steel; types of rolls and method of handling required to obtain desired shapes; accessories. (To be continued.) (F23, 1-16, W23a, W23b, W23c, 1-2)

168-F. (German.) **Flow Separation Angle and Relative Velocity During Rolling and Flattening.** Zygmunt Wusatowski and Zbigniew Szalajda. *Neue Hütte,* v. 2, June 1957, p. 367-375.

Measuring instruments designed for the tests; calcuation of the circumferential velocity of the rolls and of the velocity of rolled products based on oscillograph recordings; relative velocity determination by means of notches. 10 ref. (F23, S18n)

169-F. (Italian.) **Stamping of Metals by Means of Hot Plastic Deformation. Pt. 4. Preparation of Forging Stock.** *Rivista di Meccanica,* Mar. 1957, p. 35-37.

Types of stock used; dimensional tolerances of rolled and drawn ferrous bar stock; heat treat condition of stock. (To be continued.) (F22)

170-F. (Russian.) **Temperature Distribution of Ingot Heating in Regenerative Soaking Pits.** E. I. Kazantsev and M. N. Strelets. *Stal',* v. 17, Apr. 1957, p. 358-361.

Experimental investigation of the quality of ingot heating in regenerative soaking pits; variations of asymmetrical ingot heating as a function of time; conditions for preventing the flashing off of the mild rimmed steel ingots. (F21b; ST-d, 5-9)

171-F. Spray Lubricates Extrusion Dies Faster. *Iron Age,* v. 180, Aug. 29, 1957, p. 70-71.

Spray lubrication of extrusion dies results in good finish on aluminum extrusions. (F24, 18-23)

172-F. Developments in Aluminum Extrusion Techniques. *Machinery,* v. 91, Aug. 30, 1957, p. 485-488.

Equipment recently installed in the light press plant of the Kaiser Aluminum & Chemical Corp. (F24, 1-2; Al)

173-F. Extrusion of a Complex Shape Through a Round Die. William E. Ray. *Metal Progress,* v. 72, Sept. 1957, p. 65-69.

A long, straight control rod of Y-shaped cross-section for a nuclear reactor is made by canning flat cermet compacts, assembling them with appropriate inserts of soft steel to fill a sealed sheath, hot extruding the combination, and then dissolving the soft steel inserts in acid, leaving behind the required stainless-clad rod. (T11j, 17-7, F24; SS, Eu, 8-16)

174-F. (Russian.) **Roll Pass Design for Rails.** A. M. Karpunin. *Stal',* v. 17, June 1957, p. 536-540.

To raise the quality and increase the productivity it was found desirable to increase the vertical reduction of metal in the trapezoidal passes and to lower the collar of the first pass up to 20 mm. 9 ref. (F23; ST, 4-7, 17-1)

175-F. (Russian.) **Technical Improvement in the Process of Producing Thick Plate of High-Chromium Steel.** A. A. Babakov, T. A. Zhadan, V. A. Danilin, S. F. Bakuma, K. I. Antipov, M. N. Kulkova, and S. Z. Kupriakhina. *Stal',* v. 77, June 1957, p. 555-559.

To improve the technology of the production of thick plate steel X25T and X28 the authors developed a special regime in the rolling mill and heat treating plant. Fine-grained metal with increased plasticity and strength was made. (F23, J23; AY, *Cr,* 4-3)

176-F. (Czech.) **Influence of Rolling on the Resistance of Steel Sheet Against Fissure Formation During Pressing.** Bohuslav Otta and Josef Teindl. *Hutnicke Listy,* v. 12, no. 6, 1957, p. 515-517.

Influence of rolling performed with one or two inter-stage anneals on fissure formation during pressing of thin steel sheets. Sheets rolled with two inter-stage anneals showed higher percentage defective pressings than those rolled with only one inter-stage. (F23, J23; ST, 4-3)

177-F. (French.) **Contribution to the Study of Rolling Equipment. Pt. I, concluded. Malleability and Flow of Metals During Hot Rolling.** G. Grenier. *Echo des Mines et de la Metallurgie,* no. 3505, June 1957, p. 343-344.

Importance of temperatures in rolling operations. (To be continued.) (F23, Q23q)

178-F. (Italian.) **Metal Forming by Hot Plastic Deformation. Pt. 5, continued.** R. Giusfredi. *Rivista di Meccanica,* no. 165, July 6, 1957, p. 43-45.

Cropping operations and equipment. (To be continued.) (F29, 1-2)

179-F. Oscillating Shear Cuts Angles in Coil Stock. F. T. P. Plimpton, Jr. *Iron Age,* v. 180, July 4, 1957, p. 78-79.

Automatic feeding, positioning and stacking are among features of shear for cutting steel sheet.
(F29q, 1-2; ST, 4-3)

180-F. Aluminium Sheet and Strip Production. J. A. Richmond. *Metal Industry,* v. 91, Sept. 27, 1957, p. 259-264.

Casting shop, hot mills, cold mills, thin strip mills; coil finishing, plate and corrugated sheet production at the Falkirk plant of the British Aluminium Co., Ltd.
(F23, W23, 1-2; Al)

181-F. Nickel and Nickel Alloys. A. B. Graham. *Metal Industry,* v. 91, Sept. 27, 1957, p. 275-278.

Extrusion of nickel alloys (Monel and Nimonic alloys); glass lubricants; vertical and horizontal presses; drawing and inspection techniques at Henry Wiggin Co., Ltd., Glasgow. (F24, G4; Ni)

182-F. Extrusion of Steel Using Glass as a Lubricant. Development of the Sejournet Process. Pt. 2. M. Jacques Sejournet. *Iron and Coal Trades Review,* v. 174, May 31, 1957, p. 1263-1266, 1275. (From *Revue de Metallurgie,* no. 12, 1956.)

Practical applications from billet preheating to glass removal. Glass properties and properties of extruded products. (F24; ST, NM-h)

183-F. Production of Forgings at the Bromsgrove Works of Garringtons Ltd. *Metal Treatment and Drop Forging,* v. 24, Oct. 1957, p. 401-406.

To be continued. (F22)

184-F. Scaling of Billets. Pt. 2. J. Moreau and M. Cagnet. *Metal Treatment and Drop Forging,* v. 24, Oct. 1957, p. 407-415.

Depth of contamination; depth of decarburization; oxidation and influence of reheating period; isothermal kinetics of oxidation in air of four steels; nature of scaling phenomena. (To be continued.)
(F21b; ST, 4-2, 9-2)

185-F. Effects of High Strain Rate in Strip Rolling. D. G. Christopherson and B. Parsons. *Sheet Metal Industries,* v. 34, Oct. 1957, p. 769-775.

Use of a small specially designed rolling mill operating on the Stecke principle was used for testing high-conductivity copper, aluminum and mild steel. Strain-rate effect, roll-force, stress against strain curves and results of rolling tests. 6 ref.
(F23, 1-2, 3-18; Cu, Al, CN, 4-3)

186-F. Welded Tubing Spurs Zirconium Use. *Steel,* v. 141, Oct. 21, 1957, p. 80-82. (CMA)

Strip in coil form is threaded into the forming section of a tube mill until it reaches two squeeze rolls positioned under a welding head. The tube is then arc welded in an argon-helium atmosphere. Inside and outside diameter is reduced by swaging and, after vacuum annealing, the tubing is straightened in standard equipment. If further reduction is necessary, a draw bench is used with or without mandrel.
(F26p; Zr)

187-F. Processing of Uranium-Ziconium Alloys. J. W. Holladay, et al. Battelle Memorial Institute. *U. S. Atomic Energy Commission,* BMI-877, Oct. 20, 1953, 17 p. (CMA)

U-Zr alloys were prepared by arc-melting and induction melting. Forging and rolling characteristics were investigated. Some of the alloys had additives of Cb, Ti, Th, Sn, or Mo. The latter showed the most promise. (F22, F23, 17-2; U, Zr)

188-F. Zircaloy-2 Clad Bi-Metal Fuel Extrusion. R. E. Droegkamp. Westinghouse Atomic Power Division. *U. S. Atomic Energy Commission,* WAPD-FE-230, Nov. 4, 1954, 6 p. (CMA)

A uranium-silicon fuel clad with 30 mils of Zircaloy-2 and 15 mils of U-12Mo barrier layer was studied for extrusion characteristics. A maximum press capacity was required to extrude to an 18:1 reduction. The fuel erupted through the clad almost continuously along the rod length. Intimate contact without diffusion was observed. Rupture appears to have occurred because of the relative hardness of U-12Mo as compared with U-Si.
(F24; U, Zr, 8-16)

189-F. Tests Carried Out on Diamond Wire-Drawing Dies. Pt. 1. *Wire Industry,* v. 24, Sept. 1957, p. 831-835, 873.

Tests of performance of diamond dies used for drawing copper wire. (To be continued.)
(F28, W24n, 1-2; NM-k37)

190-F. Manufacture of Steel Wire for the Needle Industry. B. Hojna. *Wire Production,* v. 6, June-July 1957,

p. 5-9. (From *Strojirenstvi,* no. 11, 1956, p. 751-756.)

Manufacturing methods, metallurgical problems involved and structural changes occurring during the drawing process. (To be continued.) (F28; ST)

191-F. (French.) **Skin Pass Provides Controlled Stretch.** P. Blain. *Technique Moderne,* v. 49, July 1957, p. 391-392.

Description of rolling mill and controls capable of preventing formation of Luder's lines on steel strip. (F23, 1-2; ST, 4-3)

192-F. (French.) **Auxiliary Rolling Mill Equipment for Shearing, Slitting and Inspecting Thin Sheet and Tin Plate.** J. Breuzet. *Technique Moderne,* v. 49, p. 419-422.

Elements, functions, characteristics, selection, operation of shearing and slitting lines.
(F29n, F29q, 1-2; ST)

193-F. (Russian.) **Stress Conditions in Metal Deformation and Strip Rolling.** M. A. Benyakovskii, V. I. Kulikov, V. A. Shadrin, I. P. Kolpakov, Y. S. Kutuyev, G. G. Kustobaev, M. F. Kochniv, I. V. Esipov and B. I. Petrov. *Stal',* v. 17, Jan. 1957, p. 59-63.

Measuring stresses in strip mill units with strain gages yield data which can be utilized to increase production. (F2, W23c, X28h, 1-2)

194-F. (Russian.) **Automation of Heating Facilities in Rolling Mills.** A. M. Kulakov and I. M. Gelfand. *Stal',* v. 17, Jan. 1957, p. 80-83.

Automatic control of heating installation reduced fuel consumption, increased production and minimized scrap due to improper heating. However, automation does not extend to feeding of the metal into the furnace. (F21b, F23, 18-24)

195-F. (Russian.) **Investigation of Rate Regulator Performance on Light Merchant Mills.** O. G. Muzalevskii and B. B. Lure. *Stal',* v. 17, Feb. 1957, p. 135-140.

Efficient use of rolling rate regulator cannot be assured unless feed is properly controlled, billets made in equal lengths and slipping is eliminated in the roughing stands. (F23, X13, 1-2)

196-F. (Russian.) **Study of Diagonal Rolling on Three-Roll Tube Mill.** P. K. Teterin, F. A. Danilov and Ya. V. Manegin. *Stal',* v. 17, Feb. 1957, p. 147-151.

The study determined the nature of metal flow under the rolls, the dependence of the angle of torsion, amount of slippage, pressure on the rolls, power consumption and correlated motor load to basic technical factors. (F26s, W23h, 1-2)

197-F. (Swedish.) **Modern Copper and Aluminum Rolling Technique.** C. A. Jacobsson. *Jernkontorets Annaler,* v. 141, Aug. 1957, p. 395-456.

Techniques in rolling wire rods, tubes and strips; automation of mills. (F23, 18-24; Cu, Al)

SECTION G

SECONDARY MECHANICAL WORKING

1-G. (Dutch.) **Problems in Deep Drawing Research.** J. H. Zaat. *Metaalinstituut T. N. O.,* no. 41, June 1956, 8 p.
Discusses why, where and how deep drawing research should be carried out. (G4, A9)

2-G. **Plate Bending by Rolling. Uses of Various Types of Machines.** E. L. Tinley. *Engineering,* v. 182, Nov. 16, 1956, p. 623-625.
Roll materials and roll-surface finish; working with shim-plates for irregular shapes; forms of roll drive; bending cones; dual-purpose machines adapted for bending sections; hot working of plate; flexing roll machines. (G11, W24)

3-G. **Formability of Metals. III. Press Operations.** Lester F. Spencer. *Finish,* v. 13, Dec. 1956, p. 33-35, 37.
Die clearance factor, importance of sharpness, blanking of shapes, punching and piercing, influence of bend radius, press brake forming, flanging and beading operations. (G1, 18-1)

4-G. **How Troubleshooting Makes Bending Easier.** Federico Strasser. *Iron Age,* v. 178, Dec. 6, 1956, p. 132-134.
Points to consider in locating potential trouble spots. Bending operations. (G6)

5-G. **Stretch Forming Under Fluid Pressure.** P. B. Mellor. *Journal of the Mechanics and Physics of Solids,* v. 5, Nov. 1956, p. 41-56.
An investigation into the hydrostatic bulging of circular metal diaphragms. Derivation of strain-hardening characteristics for several materials. (G14b)

6-G. **Dimpling Stainless Steel Foil.** J. E. Hagins. *Machinery (London),* v. 89, Nov. 16, 1956, p. 1126-1127.
To avoid problems associated with wrinkling and cracking, the sheets are embossed with a pattern of dimples using an aluminum embossing die. (G3; SS, 4-6)

7-G. (German.) **Metal Cutting of Copper and Copper Alloys With Hard Metal Tools.** J. Witthoff. *Technische Mitteilungen Krupp,* v. 14, no. 5, Nov. 1956, p. 123-131.
Grinding, lapping and polishing of different types of copper and copper alloys; various phases of machining. (G18, G19, G17, T-6; Cu, 18-2)

8-G. **Shot-Peening as Protection of Surface-Damage Propeller-Blade Materials.** J. M. Lessells and R. F. Brodrick. Paper from "International Conference on Fatigue of Metals". v. III. The Institution of Mechanical Engineers. 13 p. + 2 plates.
Shot-peening, if properly controlled, considerably improves fatigue strength of subsequently damaged surfaces. Maximum improvement occurs under conditions where the depth of the compressive zone is about five times that of the gouge depth. (G23n, Q23g; ST)

9-G. (Russian.) **Cutting Steel With Oxygen in Continuous Casting Plants.** O. Sh. Spektor. *Stal',* v. 16, no. 11, Nov. 1956, p. 1042-1048.
Details of apparatus and techniques for horizontal cutting of carbon steel heated from 800 to 1200° C. (G22, D9q; CN)

10-G. (Russian.) **Effect of Cold Hardening on Drawing of Heat Resistant Materials.** N. F. Pronkin. *Stanki i Instrument,* v. 27, no. 10, Oct. 1956, p. 29-31.
Effect of cold hardening on machinability and strength. Experimetal data. Method and devices of investigation. (G4, G17, 18-1; SG-h)

11-G. **How to Find the Cheapest Machining Methods.** Robert T. Hook. *American Machinist,* v. 100, Dec. 31, 1956, p. 72-75.

The most productive approach to cutting costs, except for replacement of old machine tools, is in changing cutting tools, machining methods and in choice of materials. (G17, A4s)

12-G. High Speed-Heavy Feed Combo . . Boosts USSR Output. *American Machinist,* v. 100, Dec. 31, 1956, p. 76-80.

Machine tool cutting with up to ½ and ¾ in. per revolution, at higher than normal surface speeds raised productivity in some shops more than 50%. (G17)

13-G. Cold Extrusion of Special Nuts Cuts Costs 50%. Olaf Stepanek. *American Machinist,* v. 100, Dec. 31, 1956, p. 88-90. (From *Czechoslovak Heavy Industry,* No. 5, 1956.)

Manufacture of wheel nuts with hydraulic presses originally developed for working thermoplastics. (G5, T7f)

14-G. Here's How We Designed an Automated Plant. R. L. Hiller. *American Machinist,* v. 100, Dec. 17, 1956, p. 105-109.

New G. E. "55" motor plant in Schenectady uses straight-line flow of parts from coiled steel, used for punchings, to complete motors. (G general, 18-24)

15-G. Car Wheel Manufacture: High-Rate Production of the Works of Joseph Sankey and Son, Ltd. *Automobile Engineer,* v. 46, Dec. 1956, p. 526-533.

Rolling of rims; welding of circles; assembling and finishing of wheels. (G11, K general, T21)

16-G. Automatic Flame Cutting Closes the Design-Production Gap. Robert N. Williams. *Industry and Welding,* v. 30, Jan. 1957, p. 68-71.

Produces accurate parts suitable for welding at a rapid rate; permits initial model changes to be made cheaply. (G22)

17-G. Rugged Carbide Tools Speed Die Block Machining. F. W. Lucht and T. Kreuzer. *Iron Age,* v. 178, Dec. 20, 1956, p. 78-79.

Suggestions on best procedure for quickly removing excess stock in large dies with use of carbide tipped face milling cutters. (G17b, W25)

18-G. When to Convert to Stamping. Federico Strasser. *Iron Age,* v. 178, Dec. 20, 1956, p. 84-87.

Determination by use of functional designs when stamping the part will be an improvement compared to casting, forging or machining. (G3, 17-1)

19-G. Ductile Spring Steel Withstands Severe Forming. *Iron Age,* v. 178, Dec. 20, 1956, p. 90.

Composition and advantages of special spring steel for automotive piston ring. (G general, T21; ST, SGA-b)

20-G. Draw Bending Keeps Output Up, Costs Down. S. L. Santillo. *Iron Age,* v. 178, Dec. 27, 1956, p. 58-59.

Automatic draw bending allows accuracy within ± ½° for 800 bends hourly in tubing or bar stock. (G6, 4-5, 4-10)

21-G. Cold Extrusion of Titanium. A. M. Sabroff and P. D. Frost. *Light Metal Age,* v. 14, Dec. 1956, p. 19-20.

Advantages of cold extruding titanium are strengthening through work hardening, time and material savings, good tolerances and finish, and production of an uninterrupted fiber flow. A surface treatment was developed by Battelle for titanium extrusion material; an adherent, continuous coat is provided by immersion in a fluoride-phosphate bath. Cold extrusion studies were carried out on titanium grades AMS 4900 and AMS 4921. Working pressures are comparable with those in cold extruding steel. Data are tabulated and curves are shown. (G5; Ti)

22-G. Forming 6A1-4V Titanium Alloy. A. G. Lucas. *Light Metal Age,* v. 14, Dec. 1956, p. 21-24, 42. (CMA)

Ti-6A1-4V sheet can be formed on typical equipment at both room and high temperatures, and this fact is applied by Boeing in airframe construction. Forming must be complete enough to allow cold clamping of the part in the aging treatment (4 hr. at 1000° F.); the fixture used is described. Most Ti-6A1-4V forming is done in the annealed state. At 6t bend radius is possible with conventional equipment at 68° F. A formability index is shown graphically which compares Ti-6A1-4V with RC-70 and other titanium alloys. (G general, Q23q; Ti)

23-G. Fuel Injectors Call for Microscopic Methods. John Hedges. *Machinery,* v. 63, Jan. 1957, p. 127-131.

Techniques for production, finishing and inspection. (G general, L general, S general, W11)

24-G. "Mastering" Master Gears. Martin A. Hartman. *Machinery,* v. 63, Jan. 1957, p. 134-140.

Preparation of spur and helical external master gears: composition,

tolerances, forming, grinding and inspecting. (G17, G18, T7a)

25-G. Fabrication of Aluminum: Press Forming, Roll Forming, Forging. V. A. McChesny. *Modern Metals,* v. 12, Dec. 1956, p. 66-73.

Factors determining alloy selection, forming or forging method, design and lubrication of die and annealing. (G1, G11, F22, J23; Al)

26-G. Aircraft Bolt Production Stepped up 16 Times. *Pacific Factory,* v. 86, Dec. 1956, p. 30. (CMA)

Voi-Shan Manufacturing Co. (Culver City) switched to cemented carbide dies in hot heading titanium aircraft bolts and increased production 16 times. The increase is attributed to improved resistance to galling and seizing. Hot heading is used in preference to cold heading because of the superior physical qualities of the fastener. The process is described. Special precision-built Carboloy grade 190 dies last as long as 50,000 bolts before failure. (G10, T7; Ti)

27-G. Conventional Equipment Adapted to Special Forming Problem. *Pacific Factory,* v. 86, Dec. 1956, p. 32. (CMA)

Titanium alloy sheet is formed on conventional equipment by Boeing. Integrally heated toolsteel dies show promise of being adaptable to drop-hammer operations; a flame-sprayed coating of Ni-Cr-B is appplied as a lubricant. One punch thus protected has not shown corrosion or wear damage. Electric heat is used for heating blank sheet, but premixed gas heat is preferable for integrally heating the larger tools. While forming problems remain, Ti-6Al-4V has been successfully formed into complex shapes. (G general, F22n, W23; Ti)

28-G. Wrap-Around Eases Bending Chores. *Steel,* v. 139, Dec. 3, 1956, p. 136.

Stretch forming machine maintains contours of a thin corrugated aluminum sheet bent 180°. (G9; Al)

29-G. The Use and Properties of Non-Flammable Liquids in Manufacturing Process. David Milne. *Steel Processing,* v. 42, Dec. 1956, p. 686-691, 714.

Necessary properties of liquids used for hydraulic fluids, machining operations, metal cleaning, sound deadeners, rustproofing, stretcher rolling operations, painting operations and quenching of heat treated metals. (G general, L general, J26, 1)

30-G. Phases of Hole Grinding. Part I. John E. Hyler. *Steel Processing,* v. 42, no. 12, Dec. 1956, p. 695-699.

Consideration of methods, machines and problems in internal grinding. (G18j)

31-G. Bending by Rolling of Ferrous and Non-Ferrous Plate. Part 1. E. L. Tinley. *Welding and Metal Fabrication,* v. 24, No. 12, Dec. 1956, p. 452-455.

Various forms in which designs of roller bending machines have been developed to meet the varied requirements of the plate fabricating industry. Reference chart indicating best applications for machine types. (G11; ST, 4-3)

32-G. The Zirconium Program at Bridegport Brass Company. R. S. French. Paper from "Zirconium—Technology and Economics". Atomic Industrial Forum, p. 69-71. (CMA)

The interest of Bridgeport Brass in zirconium has, until recently, been one of research in deep drawing zirconium shells. A means of making zirconium tubes ranging from 3-in. extrusions to ⅜-in. sizes (cold drawn); rod has also been extruded. Problems of analysis and annealing discussed. (G4b, F24; Zr)

33-G. German Production Methods Today. William F. Schiecher. *Machine and Tool Blue Book,* v. 52, Jan. 1957, p. 103-112.

Progress of German industry, particularly the machine tool industry, since World War II. (G general)

34-G. How Ford Increased Production With Ceramic Tools. *Machine and Tool Blue Book,* v. 52, Jan. 1957, p. 140-143.

Since applying cemented oxide tools, changes have been reduced, cycle time reduced, machine speeds increased and finishes improved. (G17, T6, 6-20)

35-G. Some Observations With the Electric Spark Machining Process. G. R. Wilms and J. B. Wade. *Metallurgia,* v. 54, Dec. 1956, p. 263-268.

A study of spark machining of aluminum, antimony, chromium and iron and of resultant cracking and deformation. 14 ref. (G24a; Al, Sb, Cr, CI)

36-G. When to Consider Aluminum Cold Extrusions. R. A. Guadt. *Pacific Factory,* v. 86, Dec 1956, p. 26-27.

Six factors to consider when designing toward cold extruusion; alloys and finishes available.
(G5, 17-1, Al)

37-G. Better Metals Formed on Improved Presses and Dies. *Production,* v. 39, Jan. 1957, p. 115-120.

Description of new Chrysler stamping plant at Twinsburg, Ohio. (G3)

38-G. Machining Forum on Technical Progress. *Steel,* v. 140, Jan. 7, 1957, p. 332-350.

Twenty-one of the industry's executives outline recent developments. A few of these advances are increasing use of tape and card controls in small lot production shops, greater use of surface grinders, ceramic tooling factor in future tool design. (G17, G18, G19, G24)

39-G. Wood Shapers Rout Superalloys at 2000 Sfpm. H. J. Tangerman. *American Machinist,* v. 101, Jan. 14, 1957, p. 107-108.

Boeing Airplane Co. using CO_2 as a cutting fluid routs titanium, 400 series stainless and magnesium alloys. (G17c; Ti, Mg, SS)

40-G. Shock Forming With Explosives. E. J. Tangerman. *American Machinist,* v. 101, Jan. 14, 1957, p. 110-111.

Possibility of using explosives to cope with some of the problems in the field of fabrication of high tensile stainless steels and titanium alloys. (G general, NM-k34; SS, Ti)

41-G. Explosives Fabricate Metal at Lockheed. Glen N. Rardin. *American Machinist,* v. 101, Jan. 14, 1957, p. 112-115.

Preliminary investigations in hole punching, pressure forming with low explosives and pressure forming with high explosives point out the constructive future of explosives in industry. (G general; NM-k34)

42-G. What Chips Really Mean to Carbide Cutters. Horace Frommelt. *Iron Age,* v. 179, Jan. 10, 1957, p. 59-62.

Points to watch in milling practice as indicated by chip clearance, chip size and method of milling.
(G17b)

43-G. Press Draws Heavy Torque Tube Flanges. *Iron Age,* v. 179, Jan. 10, 1957, p. 69.

Flange for automobile automatically drawn with successive dies from hot rolled steel. (G4, W24; CN)

44-G. Effect of Stamping Plant Requirements on Steel Industry Operations. A. J. Hole. *Iron and Steel Engineer,* v. 34, Jan. 1957, p. 89-91.

Stamping plant requirements are: wider sheets of improved drawing quality, finer surface finishes, greater ductility, better scheduling and packing. (G3, Q23q; ST, 4-3)

45-G. Some Examples of Bonded Diamond Tools. *Machinery,* v. 90, Jan. 4, 1957, p. 18-20.

Diamond surface wheel for grinding compacted tungsten carbide in the green state.
(G18k, NM-k37; W, 6-19)

46-G. Stretch-Forming Titanium Sections. R. A. Kiehl. *Machinery (London),* v. 89, Dec. 28, 1956, p. 1451-1452. (CMA)

Stretch-wrapping is a suitable way to fabricate Ti-8Mn if proper precautions are taken. Workpieces should have machined or polished edges, be carefully inspected for flaws and have an acid etching prior to forming. A good grip by the machine is assured if hardened jaws with sharp, clean serrations are used. Overforming on the stretchblock compensates for springback. Close dimensional control, frequent inspections and stress-relief are also important. (G9; Ti)

47-G. Russians Discover Spark Cutting. *Metal Progress,* v. 71, Jan. 1957, p. 121-125.

Pressing and forming dies of chromium steel are formed with brass or copper-graphite tools, usually in three stages. Reconditioning of dies is also recommended. A very thin but very hard, wear resisting layer on cutting tools and machine parts is produced by sparking dry while vibrating the contacts continuously. (G24a, T6; TS)

48-G. Getting Titanium Parts Mass Produced. J. L. LaMarca and J. L. McCabe. *Society of Automotive Engineers, Journal,* v. 65, no. 1, Jan. 1957, p. 75-77. (CMA)

The four great manufacturing problems for titanium jet parts are getting acceptable forgings, heat treating to recover ductility, development of machining processes, and reducing the hydrogen content. Solutions to these problems have come forward with greater experience. Vacuum annealing effectively reduced the hydrogen content, changing tool geometry was helpful in machining and a heat treatment was developed in the form of a descending isothermal plateau.
(G17, J23, 1-23; Ti)

49-G. Lubrication Forum on Technical Progress. *Steel,* v. 140, Jan. 7, 1957, p. 409-416.

Brief comments on recent trends by 15 authorities. A few of these are: new water solubles good for both cutting and grinding, silicones conquer both high and low temperature problems and lubrication becomes more centralized and automatic. (G17, G18, 18-23; NM-h)

50-G. Cold Heading Branches Out. *Steel,* v. 140, Jan. 14, 1957, p. 71-74.

The advantages including increased strength, material savings, difficult configurations, close tolerances and high production rate have stimulated the use of this process for production of large variety of small parts. (G10, 1-17)

51-G. Belt Grinding Adapted to Motor Rotor Finishing. *Tooling and Production,* v. 22, Jan. 1957, p. 151.

Specially fixtured abrasive belt grinder finishes motor rotors to 0.0001 in. concentricity tolerance. (G18k)

52-G. Bending by Rolling of Ferrous and Non-Ferrous Plate—2. E. L. Tinley, M. I. Mech. *Welding and Metal Fabrication,* v. 25, Jan. 1957, p. 24-27.

Functions of pyramid and pinch type machines with reference to minimum diameter of cylinders rolled, completed cylinder removal, overload protection, roll crowning, roll surfaces, roll drive, and interchangeability of top roll. (To be continued.) (G11, W23)

53-G. Cold Extrusion of Unalloyed Titanium. A. M. Sabroff, O. J. Huber and P. D. Frost. *American Society of Mechanical Engineers, Paper 56-A-88,* 1956, 8 p. (CMA)

The successful cold extrusion of titanium has been demonstrated by Battelle; the grades used had yield strengths of 45,000 and 70,000 psi. A smooth surface was obtained and seizing, and galling were prevented by use of a fluoride-phosphate coat and an oil-graphite-MoS_2 lubricant. Bars extruded to 40%, 50% and 60% reductions had adequate ductility and strength increases up to 60%. (G5; Ti)

54-G. Economic Factors Must Govern Wheel Selection for Grinding Carbides. F. J. Lennon. *Australasian Engineer,* v. 49, Nov. 7, 1956, p. 89-97.

Grinding of sintered carbide can be accomplished with silicon carbide abrasives. (G18; NM-j, 6-19)

55-G. Ultrasonic Machining of Hard Metals. N. Pudney. *Australasian Engineer,* v. 49, Nov. 7, 1956, p. 100-107.

Description of the process; generation of ultrasonic vibration, cutting rates, cutting mechanism and surface finish. (G24c)

56-G. More Work With Fewer Wheel Changes. John E. Hyler. *The Australasian Manufacturer,* v. 41, Dec. 1, 1956, p. 72-73.

Abrasive wheels as grinders. (G18)

57-G. Cemented Carbide Dies for Hot Heading Titanium Bolts. *Automotive Industries,* v. 116, Jan. 15, 1957, p. 100. (CMA)

Voi-Shan Mfg. Co. switched to cemented carbide dies in hot heading titanium aircraft bolts, and increased production 16 times. The increase is attributed to improved resistance to galling and seizing. Hot heading is used in preference to cold heading because of the superior physical qualities of the fastener. The process is described. Special precision-built Carboloy grade 190 dies last as long as 50,000 bolts before failure. (G10, 1-16; Ti)

58-G. Formability of Metals, Part 4. Lester F. Spencer. *Finishing,* v. 14, Jan. 1957, p. 75-79.

Roll forming high nickel alloys; suitable alloys; forming contoured sections. 10 ref. (G11; Ni)

59-G. Chem-Mill: a Chemical Process Which Does the Work of Milling Machines. *Industrial and Engineering Chemistry,* v. 49, Jan. 1957, p. 129A-130A.

Etching reaction, solution control and instrumentation. (G24b)

60-G. Gouging Castings With Carbon Arc Speeds Preparation for Welding. Ted Roberts. *Industry and Welding,* v. 30, Feb. 1957, p. 82-86.

Carbon-arc compressed air torch used in gouging cast segments of turbine. (G22; ST, 5)

61-G. Research Into Some Metal-Forming and Shaping Operations. W. Johnson. *Sheet Metals Industries,* v. 14, Jan. 1957, p. 41-50.

Investigation on drawing and redrawing of cylindrical shells. Summarizes knowledge of the mechanics of certain metalworking operations as studied in theory at the University of Sheffield over a number of years. 9 ref. (G4)

62-G. The Metallurgy of Steels for Deep Drawing. A. J. K. Honeyman. *Sheet Metals Industries,* v. 14, Jan. 1957, p. 51-65.

Brief description of cup-drawing. Survey of factors influencing deep drawing such as composition of steels, grain size and structure, mechanical properties, directionality, stabilized steels, yielding, aging, etc. Methods of assessing deep drawing discussed. 14 ref. (G4c, Q23q; ST)

63-G. **Research Into Some Metal-Forming and Shaping Operations.** W. Johnson. *Sheet Metal Industries,* v. 34, Feb. 1957, p. 121-127.

Detection and measurement of residual stresses in cold drawn tubes, impact extrusion, and coining. (concluded.) 16 ref.
(G4, 1-17, G5, G3n, Q25h)

64-G. **Phases of Hole Grinding, Part II.** John E. Hyler. *Steel Processing,* v. 43, Jan. 1957, p. 31-35, 45.

Drives, speeds, wheel selection, wheel mounting and wheel dressing for precision internal grinding.
(G18j, 1-2)

65-G. **Preparation and Testing of a Titanium-Lined Pipe Section for Standard Ring-Joint Gaskets.** V. M. Hovis, et al. *U. S. Atomic Energy Commission,* K-1288, Jan. 23, 1957, 33 p. (CMA)

A pipe is described which was fitted with a liner made of welded titanium tube. A hot spinning method was successful in extending titanium out over flanges. Tests were conducted with pressures up to 2000 psi. at 600° F. and showed that the joint was leak-tight. Stainless steel gaskets, gold plated, were satisfactory and prevented damage to the titanium liner.
(G13, 1-16, Q10; Ti, 4-10)

66-G. **Metal Gathering by the Resistance-Heating Process.** W. F. Haessly. *Welding Journal,* v. 36, Feb. 1957, p. 132-140.

Metal gathering or "progressive resistance hot upsetting" by the 60-cycle resitance heating method is having greater use in the forming of such metals as Silicrome valve steels, jet engine turbine blades and other aircraft parts. The variables that must be controlled, techniques involved, application information and results. (G general, K3, 1-2; SGA-h)

67-G. **Boeing Uncorks Bottleneck, Licks Forming Problems on Titanium Alloys.** *Western Metals,* v. 15, Jan. 1957, p. 62-63. (CMA)

Ti-6A1-4V sheet can be formed on typical equipment at both room and high temperatures, and this fact is applied by Boeing in airframe construction. Forming must be complete enough to allow cold clamping of the part in the aging treatment (4 hr. at 1000° F); the fixture used is described. Most Ti-6A1-4V forming is done in the annealed state. A 6t bend radius is possible with conventional equipment at 68° F. A formability index is shown graphically which compares Ti-6A1-4V with RC-70 and other titanium alloys.
(G general, Q23q; Ti)

68-G. (Portuguese.) **Cold Extrusion of Steel.** Waldemar de Lima e Silva. *Engenharia, Mineracao e Metalurgia,* v. 24, Oct. 1956, p. 203-206.

Cold working of metals; definition of cold extrusion; backward and forward processes; steel suitable for successful extrusion, proper tooling, lubrication, presses. (G5; ST)

69-G. **Production Contour-Etching.** *Aircraft Production,* v. 19, Jan. 1957, p. 28-40.

Etching reagents, resistant coatings and etching technique. Contour etching permits rapid removal of metal, and its introduction into the aircraft industry resulted from difficulties encountered in forming sheet metal to the required contour after machining. (G24b)

70-G. **Contour Etching.** A. W. Sheppard. *Engineer,* v. 203, Jan. 18, 1957, p. 98-99.

Chemical reactions, comparative time and the weight factors of etching. (G24b)

71-G. **Oxygen Cutting Titanium and Titanium Alloys.** G. Coates. *Engineer,* v. 203, Jan. 25, 1957, p. 132-134. (CMA)

Successful tests of the oxygen cutting of titanium described. Transformation hardening and oxygen affinity are problems involved. Cost analysis shows that the method, based on raising the surface to the melting point in an oxidizing stream, is no more expensive than sawing and has advantages with intermediate sections. Uses include cropping of billets, trimming crude sections, preparing sections for welding and scrap cutting. (G22; Ti)

72-G. **Stamping: What Type Dies to Use.** Federico Strasser. *Iron Age,* v. 179, Feb. 7, 1957, p. 99-101.

Advantages of separate compound or progressive dies for different stamping jobs. (G3, 1-2)

73-G. **Contour Etching.** A. W. Sheppard. *Machinery,* v. 90, Jan. 18, 1957, p. 153-159.

Chemical etching or milling has been applied to magnesium, titanium, copper, aluminum and steels, but with greatest success to aluminum alloys. Etching process consisting of precleaning, masking with a resistant coating, etching and neutralizing has been valuable in applications requiring intricate construction with different gage sheet. Fatigue test results are similar for machine and contour etched specimens. (G24b; Mg, Al, Ti, ST)

74-G. Machining Operations on Intricate Frame Components. *Machinery,* v. 90, Feb. 1, 1957, p. 255-258.

Principal machining operations on two airframe components, which are performed with the aid of adapted equipment at the works of General Engineering, Inc. U.S.A. One of the components forms part of the structure and lower inboard wing surface of an experimental fighter-bomber, and the other is a main wing spar beam for a light bomber. Both parts are machined from solid billets so that heavy metal removal is involved. (G17; T24)

75-G. Sawing Radio-Active Metals by the Arc-Process. Frank Bevilacqua. *Metalworking Production,* v. 101, Jan. 4, 1957, p. 11-13.

Plastic enclosed unit using rotating disk with electrical discharge through dielectric solution satisfactorily cuts variety of radioactive metals. (G24d)

76-G. Grinding Jet Blades by Abrasive Belt Method. Bartlett West. *Modern Machine Shop,* v. 29, Feb. 1957, p. 118-121.

Battery of platen-type abrasive belt grinders, coupled with simple but unique fixtures, provides for rapid stock removal in jet blade production. (G18k, 1-2)

77-G. A New Method of Electro-Machining of Hard Metals. Tasaburo Yamaguti. *Proceedings of Japan Academy,* v. 32, Oct. 1956, p. 579-584.

Experimental apparatus and circuits described, results given. (G24d, 1-2)

78-G. Some Studies of Angle Relationships in Metal Cutting. J. H. Creveling, T. F. Jordan and E. G. Thomsen. *Transactions of the ASME,* v. 79, Jan. 1957, p. 127-138.

Free-cutting steel, SAE 1113, in the annealed state, and SAE 1113 and SAE 4135 in the cold rolled condition, studied in orthogonal metal cutting. Theory, experimental procedure, results. 17 ref. (G17; CN, AY, SGA-k)

79-G. Influence of Grinding Fluids Upon Residual Stress in Hardened Steel. H. R. Letner. *Transactions of the ASME,* v. 79, Jan. 1957, p. 149-153.

Stresses were analyzed in bars of hardened ball-bearing steel, surface ground in the presence of 13 different fluids. Results suggest that the effectiveness of a fluid in minimizing residual grinding stresses depends upon its ability to reduce frictional forces between the wheel and the work. 8 ref. (G18, Q25h; ST, NM-h)

80-G. (Japanese.) **Deep Drawing of Rectangular Vessel.** Nobuji Fukni, Seita Yoshida, Kumio Abe and Yujuo Horita. *Nippon Kikai Gakaishi,* v. 59, Dec. 1956, p. 898-903.

Limit of deep drawing and maximum deep drawing force. Experimental results on test pieces such as aluminum, copper and brass. (G4b; Al, Cu)

81-G. (Japanese.) **Mechanical Working by Supersonics.** Gentaro Nishinaura. *Nippon Kikai Gakaishi,* v. 59, Dec. 1956, p. 904-915.

Free vibration of exponential horn, compulsory vibration of exponential horn, and mechanism of throwing action. 12 ref. (G24c)

82-G. Contour-Etching. A. W. Sheppard. *Aircraft Production,* v. 19, Feb. 1957, p. 71.

Process of removing metal by controlled chemical action; taper contour-etching; physical and mechanical effects of contour etching. (G24b)

83-G. Consider All Variables, and Superalloys Will Not Hurt Production Rates. M. L. Schuehle and H. L. Bartow. *American Machinist,* v. 101, Feb. 25, 1957, p. 145-148. (CMA)

Developments in working titanium are considered. It has been shown that existing tools and methods are applicable to fabricating airframes from Ti-6Al-4V. Results are given for rough and finish profile milling of titanium alloys and stainless steels. (G17b; Ti, SS)

84-G. Ultrafinishing—a New High-Precision Lapping Process. T. G. Lewis. *American Society of Mechanical Engineers,* Preprint no. 56-A-77, Nov. 1956, 8 p.

A number of important innovations have been made which permit

the use of lapping for the production of exceptionally smooth metal surfaces with precise geometrical control. The body of patented techniques, called ultrafinishing, includes the necessary variations in velocity to permit the lapping of soft homogeneous and hard heterogeneous metals. (G19p)

85-G. Transient Interface Temperatures in Plain Peripheral Milling. D. E. Mcferon and B. T. Chao. *American Society of Mechanical Engineers,* Preprint 56-A-89, Nov. 1956, 9 p.

The analytical calculation of tool-chip interface temperature has been extended to the plain peripheral milling process. The solution of the equations presented enables an investigation of the effects of material and process variables to be made from cutting data. 22 ref. (G17, Q2g)

86-G. Shear-Strain Rate in Metal Cutting and Its Effects on Shear Flow Stress. D. Kececioglu. *American Society of Mechanical Engineers,* Preprint 56-A-154, Nov. 1956, 24 p.

A relationship is derived from the average shear-strain rate in the shear zone, during orthogonal or oblique cutting, which may be calculated if the average shear-zone thickness is described. This involves the use of a mechanism that stops the cutting process practically instantaneously and thus "freezes" the process of chip formation. (G17, Q2g)

87-G. Ceramic and Carbide Tool Performance Tests—Part I. A. U. Schmit, I. Ham and G. E. Wilson. *American Society of Mechanical Engineers,* Preprint 56-A-218, Nov. 1956, 15 p.

The report summarizes findings of a series of comparative laboratory and shop tests with ceramic and carbide tools; consideration of the design, mounting and grinding of tools, increased rigidity, adequate speed and feed ranges and sufficient power must be provided in machine tools to utilize the full potential of ceramics. (G17, T6; 6-19, 6-20)

88-G. Abrasive Cutter Sails Through Tough Super-Alloys. Curtis Cummings. *Iron Age,* v. 179, Feb. 21, 1957, p. 96-98.

Tough alloys such as Hastelloy are cut at rates of 4 to 6 sq. in. per min. with an accuracy of plus or minus 1/32 in. by abrasive cut-off machines. (G17, 1-2; Co)

89-G. A New Method of Cold Extrusion. Mahito Kunogi. *Japanese Scientific Research Institute, Journal,* v. 50, Dec. 1956, p. 215-246.

A new method developed as a consequence of analysis of plastic flow in the cold extrusion process for steel. In the new process, the extrusion pressure is reduced about 40% compared with the usual one, this method can be applied to the cold forming process of a wide variety of steels such as nitriding steel, special toolsteel, bearing steel, and austenitic stainless steel. (G5; AY, TS, SS)

90-G. Magnesium Forming. R. G. Wilkinson. *Metal Industry,* v. 90, Feb. 1957, p. 83-86.

Some of the problems involved in the hot forming and joining of magnesium alloys in aircraft production. (G general, K general; Mg)

91-G. Drawing of Titanium. J. S. Kirkpatrick. *Metal Progress,* v. 71, Feb. 1957, p. 148-150. (From American Society of Tool Engineers, Collected Papers 24T2.) (CMA)

History, crystal structure and available fabricated forms; use in military aircraft. Alloys are more difficult to form than metal. Heating the dies, stress-relief and lubrication of the die are discussed. (G4; Ti)

92-G. Researches on the Lapping of Metals. II. On Velocity and Lapping Method. Hideo Tsurva. *Osaka University, Technology Reports,* v. 5, Oct. 1955, p. 411-417.

Results of experiments on the working velocity and on the lapping fluid that have effects on the mechanism of cutting. Lapping removal varies with the kind of lapping fluid. Petroleum and rape oil give the best performance. (G19p, NM-h)

93-G. Titanium Chips Can Be Broken Easily. J. L. Wennberg. *Tool Engineer,* v. 38, Mar. 1957, p. 91-94. (CMA)

Study of the chip-breaking characteristics of titanium in machining operations shows that titanium chips can be controlled. The chip-breaking feed and chip thickness increase as the speed decreases, and the chips are more work hardened and more difficult to break. The prevailing chip type is an intermittent connected series of 3 to 10 "9"s. Graphs are shown which indicate the best position for a chip breaker. (G17; Ti)

94-G. Roll Planishing Gives Improved Joint Efficiency. H. L. Mere-

dith and B. R. Russell. *Welding Engineer,* v. 42, Feb. 1957, p. 68-72.

Roll planishing of sheet metal welds increased tensile yield and fatigue strengths and slightly decreased elongation. Relationships between weld dimensions and planishing process. (G23s; 7-1)

95-G. Ultrasonic Impact Grinding Produces Precise Shaped Holes, Slots on Servo-Valves With Ease. A. E. Shumate. *Western Metals,* v. 15, Feb. 1957, p. 41-43.

Abrasive particles set in motion by tool vibrating at rate of 25,000 cm. per sec. precision cuts small holes or slots in variety of hard metals. (G24c)

96-G. Electrical Discharge Method Machines Complex Forms on Convair's Carbide Tools. R. S. Watt. *Western Metals,* v. 15, Feb. 1957, p. 52-53.

Finishes and cutting edges of carbide tipped turning and facing tools obtained by electrical discharge were superior to those obtained by diamond wheel grinding. Pantograph attachment eliminated master tool and allowed direct reproduction of each form. (G24a)

97-G. The Machining Properties of Non-Ferrous Metals. D. F. Galloway. Paper from "Final Forming and Shaping of Non-Ferrous Metals". Institute of Metals, 1956, p. 5-15.

Apparatus for measurement of cutting forces and tool shape, considerations influencing the design of experiments. The diversity of the machining properties of nonferrous alloys is exemplified by comparisons of cutting forces for a range of nonferrous and ferrous alloys. (G17, 1-3, A9p; EG-a38)

98-G. The Deep Drawing and Spinning of Sheet Metal, With Particular Reference to Non-Ferrous Materials. John A. Grainger. Paper from "Final Forming and Shaping of Non-Ferrous Metals". Institute of Metals, 1956, p. 17-30.

Recent developments in machines and methods for the deep drawing and spinning of sheet are reviewed. Particular attention is devoted to techniques, such as marforming, hydroforming, and flowturning, which provide an inexpensive means of producing small quantities of parts, and to their application to nonferrous metals. Lubrication is also discussed.
(G4b, G13, G14b; EG-a38, 4-3)

99-G. Rubber Pressing. J. Fielding. Paper from "Final Forming and Shaping of Non-Ferrous Metals". Institute of Metals, 1956, p. 31-43.

Reasons why rubber pressing is used for the forming of aircraft components. Methods and equipment for forming aluminum and magnesium alloys and titanium. Deformations possible with straight and curved flanges and the effects of heat treatment, flange design and sheet thickness outlined to provide information for the designer. The merits of "cold" and "hot" forming of magnesium alloys and titanium are discussed, and details of the hot pressing techniques are given with special reference to die materials, temperatures, pressures and heat resisting rubber. 10 ref.
(G14a, 1-2; Al, Mg, Ti)

100-G. Research Into Some Metal-Forming and Shaping Operations. W. Johnson. Paper from "Final Forming and Shaping of Non-Ferrous Metals". Institute of Metals, 1956, p. 45-59.

Experimental and theoretical investigations of the drawing of cylindrical shells with hemispherical and flat-headed punches, with particular reference to the effects of lubrication, drawing speed and flange wrinkling; coining; ironing; tube-sinking; impact extrusion under a drop hammer; detection and measurement of residual stress in cold drawn tubes. (G4, G3, G5, Q25h)

101-G. Cold Roll-Forming and Manipulation of Light-Gauge Sections. E. Griffin. Paper from "Final Forming and Shaping of Non-Ferrous Metals". Institute of Metals, 1956, p. 61-77.

Advantages of cold forming as a method for producing sections of complicated profile from strip in large quantity. The forming process described in detail, with accounts of the types of machine used and their capacities, calculation of power requirements, and the design and manufacture of roll-forming tools. (G11, 1-17, 1-2)

102-G. Stretch-Forming of Non-Ferrous Metals. R. D. Edwards. Paper from "Final Forming and Shaping of Non-Ferrous Metals". Institute of Metals, 1956, p. 79-89.

After a brief account of the theory of stretch-forming, machines and methods are described for stretch-forming aluminum alloy sheets, extrusions, and sections for use mainly in the aircraft industry. Aspects dealt with include the limitations of

the method, effects of heat treatment and differential work hardening, type of stretch-forming and stretch-wrapping machines, and the design of, and materials for tools.
(G9, 1-2; EG-a38)

103-G. Bending and Allied Forming Operations. T. G. Perry. Paper from "Final Forming and Shaping of Non-Ferrous Metals". Institute of Metals, 1956, p. 91-96.

Metallurgical factors involved in plain bending, tube bending, flanging and rolling. Concept of the strain-hardening exponent is used to provide empirical relationships for rolling machine capacities, and for buckling criteria in bending.
(G6, Q5g)

104-G. The Hot Forming of Magnesium Alloys. R. G. Wilkinson. Paper from "Final Forming and Shaping of Non-Ferrous Metals". Institute of Metals, 1956, p. 97-108.

Magnesium-base alloys, having a close-packed hexagonal crystal lattice, are capable of only limited cold deformation, and so, unless the work is very simple, they are usually formed at elevated temperature. This practice involves obvious operational disadvantages, but possesses important compensating features. After detailing the compositions and mechanical properties of the principal wrought alloys and giving data on the effects of heating on the properties, the special requirements in equipment and procedures for hot forming sheet and extrusions are reviewed. (G general, 1-16, 1-2; Mg)

105-G. (German.) **A New System of Straightening.** Manfred Müller. *Draht,* v. 8, Jan. 1957, p. 1-3.

Description of a thread-rolling machine with rotating roll for straightening cylindrical parts such as valves, heat treated set screws, etc.
(G12, 1-2)

106-G. (Russian.) **Heat Balance Sheet of Cutting Titanium Alloy VT2.** A. M. Danielyan. *Vestnik Mashinostroeniya,* v. 37, Jan. 1957, p. 39-43. (CMA)

The total amount of heat developed during cutting of titanium alloy TV2 (Russian designation) was measured dynamometrically (i.e., as an equivalent of the mechanical work absorbed), and the distribution of that heat among the chips, the workpiece and the cutting tool was determined calorimetrically. Parallel measurements on steel 45 (Russian designation) served for comparisons. It was found that the general trend of the dependence of the above characteristics on the cutting speed is the same in both alloy and steel; however, the absolute values differ considerably. Thus, the cutting temperatures are generally higher for alloy VT2 than for steel 45 by 300 to 450° C.; the tool's share in the generated heat is 3 to 4 times as large in cutting the alloy than it is in cutting the steel, the difference being due to the low thermal conductivity of the titanium alloy. Eleven graphs show the changes of temperatures and heats in the chip, work and tool with increasing speed (up to 60 m. per min.). 1 ref. (G17, P11k; Ti)

107-G. Magnesium Is Drawn and Ribbed. George H. DeGroat. *American Machinist,* v. 101, Feb. 25, 1957, p. 140-141.

Draw of 8 in. in 0.091-in. sheet producing rectangular box-shape part is made with a single stroke by 200-ton hydraulic press. Tools and blank are heated to 600° F., before drawing. (G4d; Mg)

108-G. The Use of Grinding Wheels and Abrasives in Relation to Welding. W. L. Campbell-Pitt. *Engineer and Foundryman,* v. 21, Jan. 1957, p. 51-57.

Contribution of abrasives such as corundum, silicon carbide, aluminum oxide and diamonds to welding. Grinding techniques.
(G18, K general; NM-j)

109-G. Grinding Aluminum. *Grinding and Finishing,* v. 2, Feb. 1957, p. 28-32.

Aluminum grinding problems: wheel loading, undue heat and inferior surface finishes. A review of fundamentals is given. (G18; Al)

110-G. How Much do Grinding Fluids Affect Wheel Performance. Part I. J. A. Mueller. *Iron Age,* v. 179, Feb. 28, 1957, p. 79-81.

Experiments evaluating effect on amount of metal removed, wheel wear, power consumed, finish obtained and cutting rate for grinding fluids—including oils, water emulsions and gases. (To be concluded.) (G18; NM-h)

111-G. Draw, Polish Bar in One Machine. J. H. Glose. *Iron Age,* v. 179, Feb. 28, 1957, p. 88-89.

Automatic machine cold draws, cuts off, straightens and polishes steel bars of 3/16 to ½ in. from

coiled rods.
(G4, L10b, 1-2; ST, 4-5)

112-G. Cold Extrusion and Deep Drawing. O. May. *Machinery,* v. 90, Feb. 22, 1957, p. 425-428.

Choice of cold extrusion or drawing for the production of cups from blanks was influenced by the amount of waste material resulting from each process; cold extrusion reduced wastage to about 10%. Merits of slug production and details of extrusion and deep-drawing presses.
(G4b, G5; ST)

113-G. Rolling "Hats" From Tapered Strip. C. H. Beattie. *Machinery,* v. 63, March 1957, p. 157-158.

Aluminum tapered strip 30 ft. long was cold rolled to a perfect hat-shaped section. Thickness varied from 0.035 in. to 0.070 in. Forming difficulties overcome by use of a split male die. Description of operation. (G11, 1-16; Al)

114-G. How Are Your Carbide Tools Performing? Part 2. *Machinery,* v. 63, March 1957, p. 196-202.

Effects of shape, speed, feed, depth of cut and influence of cutting fluid on cutting forces and tool life is presented, documented by extensive test results. (G17, T6; 6-19)

115-G. Contour Etching. **A. W.** Sheppard. *Metal Industry,* v. 90, Jan. 18, 1957, p. 48-50.

Process of chemical milling or contour etching, by hot alkaline solution, of aluminum alloys for forming sheet to required contours dictated by design requirements. Process consist of pretreatment cleaning, application of resistance medium (known as masking), etching and post-treatment neutralizing and cleaning. Time and weight factors discussed. (G24b)

116-G. Distribution of Temperature in a Cylindrical Grinding Machine, From Starting to Steady State. G. Pablitzsch. *Microtecnic,* v. 10, no. 5, p. 215-218.

Tests showed that the running-in duration of 30 min., often specified, is far from being sufficient to bring a grinding machine to a steady state as far as temperature is concerned. Bearing play of the grinding spindle has almost permanent value after 30 min. running of the grinding machine. (G18g, P11)

117-G. Make Complex Shapes in Continuous Strips. *Steel,* v. 140, March 4, 1957, p. 95-98.

Cold roll forming, its definition, advantages, standard equipment used, roll design, materials for rolls and auxiliary equipment. A few present uses and future possibilities.
(G11, 1-17, 1-2)

118-G. (French.) **Roller Shaping of Parts Previous to Subjection to High Temperatures.** Frank J. Altman. *Machine Moderne et Revue Mecanique,* no. 575, Feb. 1957, p. 1-7.

Extensive use of stainless steel and titanium alloys in the manufacture of aircraft parts has led to an economical method of shaping the metal. A special roller is employed equipped with a cylinder of wide diameter, with variable pressure regulation, mounted upon a table with reciprocating motion. A die furnishing the necessary imprint is mounted on the table and the cylinder forces the metal, previously heated, into the cast.
(G11, 1-2; SS, Ti)

119-G. (Italian.) **Action of Lubri-Coolant Liquids in Machining of Metals by Chip Removal.** Arnaldo Recine. *Ingegneria Meccanica,* v. 5, May 1956, p. 35-40.

Discussion of lubricants and so-called co-lubricants (air, metallic oxides, self-forming metallic "soaps", and skins); limitations of liquid lubricants. (G17; NM-h)

120-G. (Italian.) **Examples of Technical Mistakes.** Edmondo Marianeschi. *Ingegneria Meccanica,* v. 5, May 1956, p. 49-50.

Inadequate preheating of Cr-Mo steel part before machining causes cracking of surface and rejection of piece. Inexpert grinding of shear blade results in intense surface heat and spoiling of blade. Internal cracking of large block of Ni-Cr steel caused by uneven heating; ultrasonic device detects flaws and pieces not machined. (G17, G18, S13g9)

121-G. Technical Manual on the Machining of Thermenol. Duraley Co. (U.S. Bureau of Aeronautics) *U.S. Office of Technical Services,* PB 121660, Feb. 1956, 22 p. $.75.

The machining of Thermenol, a new aluminum-molybdenum-iron alloy; methods include parting, turning, boring, threading, shaping, drilling, tapping and milling.
(G17, Al, Mo, Fe, SGA-h)

122-G. (Book.) **The Final Forming and Shaping of Wrought Non-Ferrous Met-**

als. 129 p. 1956. Institute of Metals, 17 Belgrave Square, London S.W., England. $3.50.

Machining properties, deep drawing, spinning, rubber pressing, metal forming and bending. The eight papers are abstracted separately. (G general; EG-a38)

123-G. Advanced Tooling Speeds Tiger Production. John P. Wright and Gosta M. Wernberg. *American Machinist,* v. 101, Mar. 11, 1957, p. 129-144.

Case histories of several processes used at Grumman in production of supersonic fighter including machining, forming, honeycomb adhesive bonding and alkaline descaling with periodic polarity reverse. (G general, K12, L12k)

124-G. Machining C-1144 Severely Cold Worked Stress Relieved Steels. Andrew Kondrath. *Automatic Machining,* v. 18, Mar. 1957, p. 44-45.

Data on machining characteristics giving speeds and feeds of stress-relieved resulphurized screw stock steels. (G17k; ST, SGA-k)

125-G. How Much Do Grinding Fluids Affect Wheel Performance? (Pt. 2). J. A. Mueller. *Iron Age,* v. 179, Mar. 7, 1957, p. 134-135.

Grinding test designed to measure relative efficiency of fluids applied in conventional manner, or introduced through grinding wheel, or as mist from nozzle. (G18; NM-h)

126-G. Cutting Tools: Great Promise for New Materials. R. T. Hook. *Iron Age,* v. 179, Mar. 14, 1957, p. 134-136.

Titanium carbide cutting tools yield finer finishes at faster cutting rate than tungsten carbide. Titanium boride and molybdenum boride show promise in cutting superalloys and have the low weld-on tendencies. Cemented ceramic tips used for machining some difficult alloys—improvements needed. (G17, T6n, Ti, Mo, C, 6-19)

127-G. Why Leaded Forgings Favor Machinists. *Iron Age,* v. 179, Mar. 14, 1957, p. 138-139.

Mechanical properties and machining comparisons on 1075 leaded or regular carbon steel. Leaded materials machine 31-58% faster. (G17k, Q general; CN, *Pb*)

128-G. Special Theory of Ultrasonic Machining. George E. Miller. *Journal of Applied Physics,* v. 28, Feb. 1957, p. 149-156.

A model is proposed for the mechanism of material removal in ultrasonic machining. From this model and fundamental physical principles, a machining rate equation is derived for the special case where solid, circular tools are used in conjunction with a puddled slurry. Suggestions for improvement of ultrasonic machining processes. (G24c)

129-G. Possibilities of Ceramic Tools. *Machine and Tool Blue Book,* v. 52, Mar. 1957, p. 145-159.

Progress reports describe tests and results made by Boeing, General Motors and Ford to investigate value of ceramic tools for machining of regular and ultra-high strength steels and titanium alloys. (G17; AY-n, Ti, SGA-j)

130-G. Titanium Carbide. W. E. Montgomery. *Machine and Tool Blue Book,* v. 52, Mar. 1957, p. 160-161.

Tests show tools from titanium carbide with molybdenum carbide bonded with nickel have exceptional crater and edge wear resistance with cutting speeds approaching ceramic tools. (G17, T6; Ti, 6-19)

131-G. Oils for Cutting Operations. A. E. Lawson and E. G. Ellis. *Petroleum,* v. 20, Mar. 1957, p. 99-102.

The advent of automation has increased the demands which are made on cutting oils, materials which have always required particular care in manufacture and selection for different operations. Review of recent developments in the field of cutting oils with regard to materials, testing and application. (G17; NM-h)

132-G. Forming Titanium and Titanium Alloy Sheet by Stretching and Other Methods—I. R. A. Kiehl. *Sheet Metal Industries,* v. 34, March 1957, p. 215-223. (CMA)

Recommended practice. Subjects covered are the benefits of pre-etching, the use of simplified heat treatment fixtures, technical data on titanium sheet, notch sensitivity and formability, advantages of different types of rubber forming, stretch and shrink flanges, springback and distortion. (G9, Q23q, Ti)

133-G. Fundamental Concepts of Oxygen Cutting. R. L. Stoecker and W. B. Moen. *Welding Journal,* v. 36, Mar. 1957, p. 151s-156s.

Chemistry and kinetics of the cutting action, gas dynamics of the oxygen stream, heat transfer mecha-

nisms and related phenomena governing metal removal by an oxygen jet. 19 ref. (G22g)

134-G. Production Machining Titanium. W. L. Carr. *Western Machinery and Steel World,* v. 48, Mar. 1957, p. 94-95. (CMA)

Rigid set-ups and sharp tools make machining titanium for the F-102 easy. Tungsten carbides are used since the titanium carbide tools tend to fuse to the work. Procedures for a titanium support to an engine mount are described. (G17; Ti)

135-G. (Italian.) **Review of Principal Characteristics of Spheroidal Cast Iron. Part II.** Domenico Mensa and Mario Noris. *Ingegneria Meccanica,* v. 5, July 1956, p. 25-34.

Further data on physical and mechanical characteristics. Data on machinability on lathes showing that with certain types of this material it is possible appreciably to reduce machining times. 22 ref. (G17k, Q general; CI-r)

136-G. (Italian.) **The Phenomenon of Flow Lines or Luder's Lines on Stamped Parts.** Raoul Secco. *Ingegneria Meccanica,* v. 5, July 1956, p. 35-38.

Examination of aspects such lines assume on stamped parts, difficulties they cause, reasons for their appearance. Relationship between appearance of lines and behavior of yield phase in stress-strain diagram. Preventive measures and efficacy of a skin pass or temper rolling. Importance of storage temperature in tendency of material to form Luder's lines. (G3, 9-21)

137-G. (Italian.) **Productivity of Tools, Machinability of Metals in Operations Requiring Chip Removal.** Tomasso Bruzzone. *Ingegneria Meccanica,* v. 5, Mar. 1956, p. 46-48.

Criteria to be borne in mind in determining proper tests. (G17k, 1-4)

138-G. (Italian.) **Machining Gears With "Generators".** Luigi Gazzaniga. *Macchine,* v. 12, Jan. 1957, p. 11-15.

New machine tools of English manufacture permit "generation" of most varied shapes and tooth depths in less time than on conventional machines. "Generator" tool in high speed steel produces medium and fine finishes. (G17g, 1-2; TS-m)

139-G. (Italian.) **High Speed Steels and Nondeforming Sulphurized Steels.** R. C. Auer. *Macchine,* v. 12, Jan. 1957, p. 27-30.

Sulphurization improves machinability as well as cutting potential of certain conventional high speed steels. Work of Latrobe Steel Co. in this field. (G17k; TS-h, TS-m, AD-q)

140-G. New Development in Impact Extrusion Field Extends Process Control. Marvin M. Goldstein. *Industrial Heating,* v. 24, Jan. 1957, p. 75-76, 82.

Machine produces slugs for impact extrusion by casting directly from molten aluminum. (G5, 1-2; Al)

141-G. Performance of Ceramic Tools. A. O. Schmidt, W. I. Phillips, C. F. Wilson and I. Ham. *Machinery,* v. 90, Mar. 15, 1957, p. 577-583.

Preliminary tool life and wear tests were made with workpieces of AISI 1045 and 4150 steels and B-45 cast iron. Performance of ceramic tools was compared with carbides, nature of wear process for ceramic tools studied. (G17, Q9, S21; SGA-j, NM-f)

142-G. The Phenomenon of Cutting. O. Kienzie. *Microtecnic,* v. 10, 1956, p. 253-256.

Investigation of the following questions: (1) What happens when metals are cut? (2) What influences the quality of the cut surface? (3) What produces a burr? (4) How is the wear of the cutting tool affected? (G17, 1-4)

143-G. Ultrasonic Grinding. Milton C. Shaw. *Microtecnic,* v. 10, 1956, p. 257-265.

Current commercial ultrasonic grinding apparatus is described and representative operating characteristics considered. Several possible sources of cutting action are presented and the equations describing these actions discussed. It is found that the primary action responsible for material removed in ultrasonic grinding is that of abrasive particles being hammered into the work surface in a manner that is somewhat similar to the comminution action found in a ball milling operation although subject to a much higher rate of metal removal and a finer degree of control. 7 ref. (G18, 1-24)

144-G. Study of the Influence of the Addition of Sulphur on the Machinability of a Medium-Carbon Steel. Paul Bastien and Michel Weisz. *Microtecnic,* v. 10, 1956, p. 723-728.

Figures given on the influence of sulphur on the coefficient of friction between chip and tool as a function of feed, and cutting temperature as a function of cutting speed. (G17k; CN, *S*)

145-G. Spinning Aluminum. (Pt. 2) J. W. Lengbridge. *Modern Metals,* v. 13, Mar. 1957, p. 40-46.

Briefly covers displacement spinning, effect of contour, calculation of blank size, spinning speeds and lubricants, equipment tool and chuck design and internal roll spinning. (G13, 1-2; Al)

146-G. (French.) **The Pressing of Metals and Light Alloys.** Robert Chopin. *Revue de l'Aluminium,* no. 236, Oct. 1956, p. 943-948.

Evolution of deep drawing; Marform, Hydroforming and Wheelon processes; pressing of conical parts with the method of swaging, pressing with a unique die, pressure on a semispherical part, forming by inside out pressing; spinning and modern flow-spinning machines; possibilities offered by impact extrusion. (G1, 1-2)

147-G. (Japanese.) **Cutting Temperature.** Keiji Okushima and Ryuji Shimoda. *Japan Society of Mechanical Engineers, Transactions,* v. 23, Feb. 1957, p. 73-77.

Deals with the possibility of application of the theoretical equation by Loewen & Shaw (1954) to orthogonal cutting with discontinuous chip under the conditions contrary to the assumptions in case of the theoretical analysis; rate at which the cutting heat diffuses to chip, tool and workpiece. (G17, 1-4)

148-G. (Pamphlet—French.) **Practical Information on the Machining of Aluminum and Its Alloys.** 64 p. 1956. L'Aluminium Francais, 23, Rue Blazac, Paris 8, France.

Mechanical characteristics of aluminum and its alloys; principal factors in their machining such as the influence of lubricants and nature of tools; problems involved; conditions of working and methods employed in turning, cutting, planing, milling, drilling, tapping, threading and sawing of aluminum and its alloys; finishing processes. (G17; Al)

149-G. (Pamphlet—French.) **Practical Information on the Manual Forming of Aluminum and Its Alloys.** 40 p. 1956. L'Aluminium Francais, 23, Rue Balzac, Paris 8, France.

Concise account of the hand working of sheets, tubes and sections of aluminum and its alloys. Details relating to storage, methods of cutting, bending, hammering, flaring, stretching and plate bending; forming tools; cold working and hot working; general precautions to be taken; faults to be avoided and appropriate techniques. (G general; Al)

150-G. Industrial Application of Cold-Flow Extruded Steel Parts. H. D. Feldmann. *Draht* (English Edition), no. 27, Feb. 1957, p. 18-29.

Development of cold-flow extrusion process; examples of suitable steels and shapes; among the advantages listed are superior mechanical properties, surface finish, fiber structure and accuracy; numerous applications include motor car electrical and fire fighting equipment components. (G5; ST)

151-G. A New Straightening Process. Manfred Müller. *Draht* (English Edition), no. 27, Feb. 1957, p. 42-46.

Machine equipped with rollers with trapezoidal thread used for straightening valves, push-rods and case-hardened shafts. (G23p, 1-2)

152-G. Research on the Cutting Performance of Fine Grain Abrasive Stone. Tokio Sasalii and Kenjiro Okamura. *Kyoto University, Memoirs of the Faculty of Engineering,* v. 18, Oct. 1956, p. 354-366.

Numerous fine-grain abrasive stones of various bond hardness, bond combining ratio, porosity and grain combining ratio, were measured for the purpose of improving cutting performance. Special testing apparatus with which stone wear, stock removal and cutting resistance could be measured was employed. (G17; NM-j)

153-G. Hot Forming, Assembly and Service Applications of Magnesium Alloys. *Machinery,* v. 90, Feb. 15, 1957, p. 376-381.

Requirements for press forming, stretch forming, deep drawing and pressing; surface protection, joining methods, including welding and adhesive bonding; current applications of wrought magnesium; recent developments in magnesium alloys. (G general, K general, T general; Mg)

154-G. Spark Machining: Equipment and Applications. D. W. Rudorff. *Machinery Market,* no. 2938, Mar. 8, 1957, p. 23-26.

Various factors bearing upon the efficiency of spark-erosion operations. Mechanical features of a typical spark-erosion machine and

the range of machining operations for which spark cutting machines can be designed. (G24a, 1-2)

155-G. **Ceramics and Carbides Compared.** L. B. Monosmith and W. G. Fisher. *Metalworking Production,* v. 101, Feb. 22, 1957, p. 325-328.

Progress report gives data from tests with SAE 4140 and 8620 machined with two makes of ceramic tool bits, conventional cemented carbides and high-titanium tungsten carbides. (G17; SGA-j, 6-19, 6-20)

156-G. **Extensive Test Runs Reported on Ceramics.** George H. De Groat. *Metalworking Production,* v. 101, Feb. 22, 1957, p. 329-332.

Ceramic cutting tools tested with variety of materials including AISI 8617, 4145, toolsteel and naval brass. Data on speeds, feeds, tool geometry and finishes obtained.
(G17; AY, TS, Cu-n, SGA-j, 6-20)

157-G. **Molybdenum Disulphide Cuts Machining Costs.** *Metalworking Production,* v. 101, Mar. 1, 1957, p. 366.

Colloidal molybdenum disulphide used as additive for cutting lubricants and coolants increased tool life in milling and turning operations. (G17; NM-h)

158-G. **More Tests With Ceramics Versus Carbides.** B. D. Smith and F. L. Helmel. *Metalworking Production,* v. 101, Mar. 1, 1957, p. 369-371.

Progress report on ceramics gives data from tests made in cutting AISI C1051 steel comparing six ceramics with standard carbide and titanium carbide.
(G17; CN, SGA-j, 6-19, 6-20)

159-G. **Ford Speeds Gear Turning With Ceramics.** George H. De Groat. *Metalworking Production,* v. 101, Mar. 1, 1957, p. 371-373.

Progress report describes finish machining of standard transmission slide and gear with ceramic tools at Ford Motor Co.
(G17g; ST, SGA-j, 6-20)

160-G. **More Light on Electric-Erosion.** *Metalworking Production,* v. 101, Mar. 1, 1957, p. 382-387.

Machining by spark discharge giving basic principles, requirements for dielectric, electrode feed control, rate of erosion, electrode material and spark-produced surface. (G24a)

161-G. **Cost Cutting With Grinding Wheels—Pt. 2. Work Pressure and Wheel Selection.** John A. Mueller. *Modern Castings,* v. 31, Mar. 1957, p. 34-35.

Work pressure is extremely critical in its effect on wheel life and cutting rates, particularly with softer wheels. (G18)

162-G. **An Analytical Study on Grinding Resistance.** Kenji Sato. *Tohoku University, Technology Reports,* v. 21, no. 1, 1956, p. 147-177.

Theoretical calculation and description of experiments on grinding resistance. (G18)

163-G. (French.) **Machining of Copper and Copper Alloys. Pt. 2. General Machining.** *Cuivre Laitons Alliages,* no. 35, Jan-Feb. 1957, p. 7-10.

Enumeration of tool nomenclature; description of tool operations; effect of shear angle; angle of clearance; cutting angles; special reference to copper, lead, bronze and brass. (To be continued.) (G17; Cu, Pb)

164-G. (French.) **Conical Deep Drawing and Impact Extrusion of Metals and Light Alloys. Pt. II.** Robert Chopin. *Revue de l'Aluminium,* no. 238, Dec. 1956, p. 1147-1154.

Procedures of inverted pressing, flow-turning and spinning of large parts; possibilities of impact extrusion processes are evaluated and an empirical method for calculating the force of the extrusion is outlined. (G4b, G13, G5)

165-G. (German.) **Cutting of Metal With Fiber Reinforced Grinding Wheels—a Highly Economical Procedure.** B. Kleinschmidt. *Metall,* v. 11, Feb. 1957, p. 116-119.

In general, cutting times are 12 to 50 times shorter when grinding wheels instead of circular saws are used. Advantages are fast amortization of cutting machine, smooth cutting plane, and no structural change of material by heating effects. (G18m, 1-2)

166-G. (German.) **Profile Milling of Heavy Workpieces.** K. Häuser. *Werkstatt und Betrieb,* v. 90, Mar. 1957, p. 191-196.

Profiling machines for the handling of large and awkwardly shaped work, particularly for the production of dies and casting molds. Large types have been developed from standard horizontal boring and milling machines. (G17b, G17d, 1-2)

167-G. (German.) **Cutting Forces During Grinding. Pt. I. Influence of Working Conditions.** H. Krug. *Werkstattstechnik und Maschinenbau,* v. 47, Jan. 1957, p. 26-35.

Structural parts of the grinding machine and their dimensions. Selection of motor horsepower and size of grinding shaft. Forces to machine material are dependent upon two groups of variables: (1) working conditions such as feed speed and depth of cut, (2) condition of grinding wheel, type of grain, binder and coolant. Second group not as well controlled as first one. 12 ref. (G18)

168-G. (German.) **Unbalance and Centrifugal Force of Grinding Wheels.** O. Kienzle and H. Münnich. *Werkstattstechnik und Maschinenbau,* v. 47, Feb. 1957, p. 69-73.

Vibrations caused by free centrifugal forces in unbalanced grinding wheels. Increasing demands for high-quality surface finishes require elimination of unbalance. Tolerances and standards. 7 ref. (G18)

169-G. (German.) **Cutting Forces During Surface Grinding. Pt. 2. Influence of Grain Size, Binder and Coolant.** H. Krug. *Werkstattstechnik und Maschinenbau,* v. 47, Feb. 1957, p. 73-78.

Influence of brittleness and toughness of abrasive and binder on cutting forces. Different abrasives, ceramic and plastic binders, dry and wet surface grinding. 2 ref. (G18k; NM-j)

170-G. (Italian.) **Contribution to the Study of the Cutting of Metals on Lathes.** Pietro Chiesorin. *Ingegneria Meccanica,* v. 5, Apr. 1956, p. 55-64.

New device designed by author for determining from three component stresses (principal, axial and normal) the cutting stress in turning operations; some experimental results obtained with the use of this instrument. Device permits direct reading. (G17k, 1-2)

171-G. Ceramic Tools for Single-Point Turning. A. B. Albrecht. *Machinery,* v. 63, Apr. 1957, p. 149-155.

Consideration of fundamental advantages of ceramic tools, tooling requirements and application to production machining. (G17, T6n; SGA-j, 6-20)

172-G. What the Designer Should Know About Cold-Heading. Theodore B. Smith. *Machinery,* v. 63, Apr. 1957, p. 194-201.

Part designer should keep in mind cold heading, which is a high-speed process producing parts with excellent grain structure, good tolerance and little scrap. Examples of parts made by cold heading. (G10, 1-17)

173-G. Titanium Alloy Suited for Stretch Formed Parts. E. J. Carr. *Materials and Methods,* v. 45, no. 4, Apr. 1957, p. 140-141. (CMA)

Ti-6Al-4V may be stretch-formed at 70° F. using conventional tools and methods, but control of jaw grip and the heat treated condition are important. High forming pressures are required. Forming tests at Boeing showed that titanium shims or clean steel jaws give the best grip, that the aging cycle used on the parts produced little distortion if they are unrestrained, that springback is not easy to remove in full hard parts, and that graphite cup grease is a suitable lubricant. (G9; Ti)

174-G. Cost Cutting With Grinding Wheels: Pt. 3. Increasing Cut-Off Wheel Efficiency. John A. Mueller. *Modern Castings,* v. 31, Apr. 1957, p. 58-59.

Stresses control of speed, cut-off rate and selection of proper wheel. (G18, 1-2)

175-G. Ingenious Tooling Simplifies a Tough Job. Henry Kowalski. *Modern Industrial Press,* v. 19, Mar. 1957, p. 25-27.

Stamping, forming and welding operations in the production of clothes dryer drums. (G general)

176-G. 950,000 Small Stampings a Day. Howard E. Jackson. *Modern Industrial Press,* v. 19, Mar. 1957, p. 30-32.

Production from coil steel strip of 400 tons of saw chains per day. (G3; ST)

177-G. Forming Titanium and Titanium Alloy Sheet by Stretching and Other Methods—Pt. 2. R. A. Kiehl. *Sheet Metal Industries,* v. 34, Apr. 1957, p. 273-285. (CMA)

Die materials used for aluminum and stainless may be used for rubber forming titanium. Steel blocks should be used for hot forming titanium. Brake forming methods used with stainless are also applicable. The same is true for stretch-wrap forming except that more operative skill is required. A planning sequence of 32 steps is presented. Skin stretching is confined to commercial titanium. Drawn parts may be formed hot or cold depending on severity; results of hot drawing tests are described. Drop or power-hammer parts can

be formed on conventional tools if local heating and good technique are used. Data presented for dimpling, joggling and spinning. (G9, G general; Ti)

178-G. Titanium Fabrication From A to Z. *Steel,* v. 140, Apr. 22, 1957, p. 94-95, 98, 100. (CMA)

Three prototype assemblies of Rem-Cru A-110AT were made by the Jet Division of Thompson Products after using at least 15 precision processes, including hot coining, piercing, drilling and tapping, hot brake forming, hot draw forming, hot sizing and radial draw forming. Plastic enclosures were used for manual welding. (G general; Ti)

179-G. Metal-Cutting Evaluation. Current Status of Various Techniques Used. F. J. Daasch. *Steel Processing and Conversion,* Mar. 1957, p. 136-141.

Review of present methods, study of tool life, tool forces, power consumption and surface quality and variables to be considered in their evaluation. 20 ref. (G17, 1-4)

180-G. Tests Compare Finishes From Cermaic and Carbide Tools. M. C. Shaw and P. A. Smith. *Tool Engineer,* v. 38, Apr. 1957, p. 97-102.

Data on microfinish, cutting force components obtained in machining AISI 1020 and 4340 steels at different speeds with ceramic and carbide cutting tools. (G17, SGA-j, 6-19, 6-20)

181-G. Safe Operation of Abrasive Wheels. *Tool Engineer,* v. 38, Apr. 1957, p. 119-122.

Precautions to be observed in selecting and operating abrasive wheels. (G18, A7p)

182-G. Machining and Welding of Titanium at Orenda Engines Ltd. L. E. Gray. *Welding and Metal Fabrication,* v. 25, Apr. 1957, p. 118-124. (CMA)

Recent years have seen much improvement in the titanium received from foundries and mills. The prime requirement in welding titanium is the exclusion of embrittling atmospheric gases from the weld. The color of the weld indicates the degree of contamination and a light straw color is tolerable. Several photographs and diagrams are shown for the welding fixtures and chambers used by Orenda. Other operations discussed are the forming of titanium sheet, roughing forged compressors of titanium and broaching. (G17, K general; Ti)

183-G. Report on Dynatomics—Phase II. A. McBride. *Western Machinery and Steel World,* v. 48, Mar. 1957, p. 91-93.

Report of application of recommended coolants in cutting and turning processes on production scale; improved tool life and higher surface finish. (G17, NM-h)

184-G. (English.) **Study on Wear Process of Carbide Tools.** Hidehiko Takeyama, Terumi Murai and Eiji Usui. *Mechanical Laboratory of Japan, Journal,* v. 2, no. 2, 1956, p. 14-24.

Tool life when machining high-grade cast iron and nickel-chromium-molybdenum steel. (G17, Q9n; SGA-j)

185-G. (German.) **Machining of Titanium.** H. Westphal. *Werkstatstechnik und Maschinenbau,* v. 47, Mar. 1957, p. 123-127. (CMA)

Using published American data, the following processes of machining titanium and its alloys are briefly reviewed: turning, boring, tapping, planing, broaching, milling and grinding, and information on sawing. 19 ref. (G17; Ti)

186-G. (Spanish.) **Quantity Production With Oxygen Cutting.** E. Seymour-Semper. *Ciencia y Técnica de la Soldadura,* v. 7, Jan-Feb. 1957, 10 p.

Comparison with mechanical methods of edge preparation; figures on productivity and precision attained by oxygen cutting. Performance of oxygen cutting can be improved notably by continuous feeding of stock and systematic mechanical handling of cut pieces. Description of multiple blowpipe machines; use of jigs and electronic tracers. (G22g, 1-2)

187-G. Metallurgy of Steels for Deep-Drawing. A. J. K. Honeyman. *Birmingham Metallurgical Society Journal,* v. 37, Mar. 1957, p. 265-496.

Review of metallurgy of deep drawing with definition and information on relationship of mechanical properties of mild openhearth steel sheet and strip to chemical composition, grain size and structure and prior cold work. Theories of yielding and aging, assessment of deep drawing properties, origin and effect of ingot surface defects. (G4b, Q23; ST, 4-3, 9-21)

188-G. Choosing Disk-Type Wheels for Weld Grinding and Finishing. *Industry and Welding,* v. 30, Apr. 1957, p. 54-60.

Five groups of depressed center reinforced flexible type disk wheels and selection of proper group for weld metal being ground. (G18k; 7-1)

189-G. Tooling for Short-Run Production. John Waller. *Sheet Metal Industries,* v. 34, Apr. 1957, p. 257-262.

Equipment and set-up for piercing and cutting metal sheets using Unipierce and Unicrop units. (To be continued.) (G2; 4-3)

190-G. High Production Machining and Testing of Hydraulic Valves. C. E. Schultheis. *Tooling and Production,* v. 23, Apr. 1957, p. 101-104.

Equipment and procedures used in machining, grinding and testing cast iron hydraulic valves at International Harvester Co.
(G17, T7b; CI)

191-G. Strain Hardening and Residual Stresses in the Boring of Structural Steels. P. E. D'yachenko and N. A. Podosenova. *Henry Brutcher Translation* no. 3753, 3 p. (From *Vestnik Mashinostroeniaa,* v. 34, no. 7, p. 45-47.) Henry Brutcher, Altadena, Calif.

Investigation of possibility of selecting such conditions of machining as will insure an optimum distribution of the residual stresses to reduce the machining stresses and improve the fatigue strength of the part being machined.
(G17, Q25h, Q7a; ST)

192-G. Gas Cutting of Steel in Continuous Casting Machines. O. Sh. Spektor. *Henry Brutcher Translation* no. 3888, 7 p. (From *Stal',* v. 16, no. 11, 1956, p. 1042-48.) Henry Brutcher, Altadena, Calif.

Previously abstracted from original. See item 9-G, 1957.
(G22, D9q; CN)

193-G. (English.) **A New Method of Electro-Machining of Hard Metals.** Tasaburo Yamaguti. *Physical Society of Japan, Journal,* v. 12, Feb. 1957, p. 204-208.

An ordinary alternating current is used, superposed with some adequate high-frequency electric oscillations. The metal and the tool are dipped in water and are adjusted to keep a certain small separation. Thus, we can initiate favorable quenched discharges in every half cycle in which the metal is in positive potential. A merit of the present method is that the developments of any cracks in the machine surface are entirely prevented, even for hard metals, such as tungsten.
(G24a; W, EG-d)

194-G. (French.) **Impact Extrusion of Aluminum Disks and Meter Gears.** *Machine Moderne et Revue Mecanique,* no. 577, Apr. 1957, p. 21-24.

Details of the conception and construction of dies used for the impact extrusion of high-precision aluminum pieces sufficiently light to cause minimal friction in the mechanism of electric meters. Equipment employed. (G5, T7; Al)

195-G. (French.) **Bumper Manufacture at the Chevrolet Plants.** Herbert Chase. *Machine Moderne et Revue Mecanique,* no. 577, Apr. 1957, p. 78-80.

Thin sheets of high-strength steel alloys, with thicknesses varying from 2.5 to 3.5 mm., are flame cleaned and polished. To protect the surface against scratches and to facilitate stamping operations, the sheets are coated first with phosphate and then with a lubricant.
(G3, L10g, L12; AY, 4-3)

196-G. (German.) **Machining Titanium With Carbide Tools.** *Technica,* v. 6, Feb. 1, 1957, p. 112-113. (CMA)

The inconsistency of the favorable chip length ratio and poor machinability of titanium is discussed; greater friction and poor heat conductivity are the explanation. Galling of the chip on the tool rapidly promotes tool failure. Heat generation is decreased by slow speeds or by altering the tool geometry. Speeds and tool geometries for carbide tools are reviewed. Rigid tool setups are required.
(G17, Ti, SGA-j, 6-19)

197-G. (Italian.) **Notes on the Machining of Stainless Steel.** Ambrogio Galbiati. *Macchine,* v. 12, Feb. 1957, p. 139-159.

Turning operations with templates; bending of sheet. (Third article in a series.) (G17, G6; SS)

198-G. (Book—Russian.) **Investigations on the Deep Drawing of Metals, No. 29.** 143 p. 1956. Moscow Aviation Technological Institute, Oborongiz, Moscow.

Results of a series of theoretical and experimental tests conducted at the stamping laboratory of the Moscow Aviation Technological Institute and dealing with the stamping of parts from sheet material. Special attention is given to the deep drawing of parts in which the blanks are preheated. (G4b)

199-G. Grinding Titanium. J. Starr. *Light Metal Age,* v. 15, Apr. 1957, p. 23. (CMA)

Research Associates of Los Angeles grind titanium and its alloys satisfactorily by using grinding wheels, grinding fluids, speeds and feeds which tend to minimize overheating, grinding time and wheel wear. Vitrified bond alumina wheels of 46-303 grain, nitrite-amine rust inhibited fluid, 1500 surface ft. per min. and 400-500 in. per min. table feeds are best. Downfeed and cross feed are 0.001 in. per pass and 0.05 in. (G18; Ti)

200-G. Properties and Possibilities of Titanium. *Machinery Lloyd,* v. 29, Apr. 13, 1957, p. 82-86. (CMA)

The effort now being expended in the development of titanium stems from its many valuable properties. Applications in the chemical processing and engineering fields await the fulfillment of the demands of the aircraft industry. ICI Metals Division has studied the machining, grinding, forming and joining of titanium. Tool materials, geometry and rigidity, speeds and feeds are recommended for milling, drilling, planing, shaping, screw-cutting and sawing operations. Forming with hydraulic presses gives good results; the rubber pad method is useful for light-gage parts. Welding processes must be modified to allow for peculiarities in titanium.
(G general, T general, 17-7; Ti)

201-G. Surface Grinding. Pt. 2. Fundamentals and Methods. *Grinding and Finishing,* Apr. 1957, p. 37-42.

Grinding conditions such as speed, angle, depth of cut and stress are reviewed. (G18k)

202-G. Analysis of Metal Cutting Processes. A. Bhattacharyya. *Institution of Engineers (India) Journal,* v. 37, Jan. 1957, p. 496-509.

Review of investigations on the action of cutting tools in machining operations and the effect of variables associated with it. Mathematical theories described here combined with the practical aspects of the problem give a reasonable opportunity to the machine tool engineer to specify machining conditions for better production. 9 ref. (G17)

203-G. Titanium Forming; 2.5 Million Lb. of Experience. *Steel,* v 140, May 20, 1957, p. 178-180, 182, 185, 188, 190, 194. (CMA)

Most of the 2.5 million lb. of titanium used by North American Aviation has gone into the jet engines, afterburner and tailpipe of the F-100 Super Sabre (583 lb. per aircraft). Current specifications for alloy sheets are given. Surface defects and bend test failures have been trouble spots. The 3% flatness specified is inadequate for some external skin parts. Blanking, shearing, bending, hot forming and pressing, stretching, straightening, deep drawing, heat treatment and cleaning are discussed. Three new alloys, Ti-3Al-6Mo, Ti-4Al-3Mo-1V and Ti-2.5Al-6V, are noted.
(G general; Ti)

204-G. Forming of Titanium and Titanium Alloys. W. P. Achbach. Battelle Memorial Institute, Titanium Metallurgical Laboratory, Report 42, Vol. I. *U.S. Office of Technical Services,* PB 121917, May 1956, 247 p. (CMA)

A survey of the airframe industry revealed 13 major forming methods for titanium sheet. The handling of questionnaires and the data therefrom are described.
(G general, T24a, 17-7; Ti, 4-3)

205-G. (French.) **Some Fundamental Machining Problems.** E. Bickel. *Metallurgie et la Construction Mecanique,* v. 89, Apr. 1957, p. 347-353.

Cutting speeds; blunting of tools; consideration of temperature and friction in various operations. (G17)

206-G. (Italian.) **Machining by Electro-Erosion.** Nicolas Mironoff and J. Pfau. *Macchine,* v. 12, Mar. 1957, p. 185-193.

New machine tool, *Eleroda DI,* manufactured by Charmilles Co., machines all conductor metals. Principle of electro-erosion machining, work cycle; general description of machine, servomechanism and hydraulic drive; characteristics of, and structural changes in, surfaces machined with this tool; applications. (G24a)

207-G. How to Grind Boron Carbide. A. L. Palm. *Industrial Diamond Review,* v. 17, Mar. 1957, p. 54-56.

With the expanding use of boron carbide for gages and other applications requiring high wear resistance, information on the finishing of this material is in increasing demand. General recommendations on selection of wheels, coolants and stock removal rates for various abrading processes. (G18; B, 6-19)

208-G. Hot Forming, Assembling and Service Applications of Magnesi-

um Alloys. R. G. Wilkinson. *Institution of Production Engineers, Journal,* v. 36, Apr. 1957, p. 224-237.

Effect of preheating on mechanical properties, preforming operations, surface protection and assembly, design factors. 9 ref. (G general; Mg, 17-1, 17-7)

209-G. Contour Etching. A. W. Sheppard. *Machinery Lloyd,* v. 29, Mar. 30, 1957, p. 70-71.

Brief description of the process; pretreatment, cleaning of material, application of resistance medium, etching and post treatment. (G24b)

210-G. Face-Milling Titanium Alloy With Carbide Cutters. W. L. Carr. *Machinery (London),* v. 90, May 10, 1957, p. 1043-1044. (CMA)

Normal milling speeds cannot be used on AMS-4925 titanium alloy with carbide-tipped cutters. Choice of rake angle is important; positive rake weakens the cutting edge and negative rake should be avoided. Speeds in the 85-110 surface ft. per min. range are recommended. Chemical coolants seem to cause chip welding to the carbide tip. (G17b, 1-2; Ti)

211-G. Metal Surveys, Machining. *Pacific Factory,* v. 87, Mar. 1957, p. 34.

Brief review of electrical discharge machining, grinding and ultrasonic machining. (G24)

212-G. Develop Process for Spinning Titanium. *Tool Engineer,* v. 38, June 1957, p. 152. (CMA)

Thick titanium hemispheres have been hot spun in production quantities, using a process developed by Titanium Fabricators, Inc. The spinning machine is of the horizontal type with an electrically driven table and is completely hydraulic. The hemispheres of Ti-6Al-4V are welded together to form pressure vessels for gas storage. (G13, 1-2; Ti)

213-G. (Czech.) **Rolling of Ball Bearings and Finished Products of Variable Cross Section.** Karel Styblo. *Hutnické Listy,* v. 12, Mar. 1957, p. 227-236.

Modern production technology of balls for antifriction bearings, and the production of parts made until now by drop forging or drop pressing, but which may be manufactured economically by rolling. Rolling methods are dealt with from the technological point of view, as well as from the point of view of the design for production equipment; results of the first experiments with rolling of balls and tapered rollers in Czechoslovakia. (G11, T7d)

214-G. (Italian.) **Theoretical Study of the Direction of Flow of Chip During the Machining of Metal Parts.** Salvatore Amari. *Macchine,* v. 12, Apr. 1957, p. 273-279.

Analysis of process of chip formation. Study of machining operations performed with tools having rectilinear cutting edges reveals parameters on which the direction of flow of chip on tool faces depends and the interrelationship of these parameters. (G17)

215-G. (Italian.) **Grinding the Ways of Machine Tool Beds.** Pier Lorenzo Levi d'Ancona. *Macchine,* v. 12, Apr. 1957, p. 297-304.

Universal grinder gives better finish at lower cost than can be obtained by scraping operation. Selection of grinding wheels for steel, cast iron and plastic ways; practical hints on technique; inspection of ground ways.
(G18, W25, 17-7; ST, CI, NM-d)

216-G. (Italian.) **Precision Grinding and Resistance to Wear.** Pietro Giustina and Gian Federico Micheletti. *Macchine,* v. 12, Apr. 1957, p. 369-377.

Procedures for measuring surface roughness; interdependence of surface roughness and resistance to wear. Surface roughness can be improved by observing close tolerances. (G18, Q9n, S15)

217-G. (Italian.) **Stamping of Metals by Means of Hot Plastic Deformation. Pt. I.** Romeo Giusfredi. *Rivista di Meccanica,* no. 153, Jan. 19, 1957, p. 23-24.

Role of hot plastic deformation in manufacturing cycle. (To be continued.) (G3)

218-G. (Italian.) **Stamping of Metals by Means of Hot Plastic Deformation. Pt. II, Cont.** Romeo Giusfredi. *Rivista di Meccanica,* no. 156, Mar. 2, 1957, p. 23-25.

Stampings and castings compared with reference to equipment required for production, dimensions and shapes obtainable, chemical composition, grain structure, dimensional tolerances, machinability, physical characteristics in case of carbon steels, probability of rejects in subsequent machining operations, weldability, production costs.
(G3, 17-2)

219-G. (Japanese.) **Study on High Speed Machining. Pt. 6. Cutting Speed Effect Based Upon Theory of Tool-Chip Contact Area.** Hidehiko Takeyama and Eiji Usui. *Government Mechanical Journal,* v. 11, Mar. 1957, p. 43-50.

Machining characteristics are improved with the shear angle and with the increase of the chip-thickness ratio. The cutting force decreases for metals with little or no built-up wedge when cutting speed is high. Shear strain in the shear plane has a tendency to be localized into a narrow zone as the cutting speed increases. (G17)

220-G. Effect of Pressure Between Tool Tip and Workpiece on the Rate of Ultrasonic Machining in Ketos Tool Steel. Dieter Goetze. *Acoustical Society of America Journal,* v. 29, Apr. 1957, p. 426-431.

Ultrasonic machining rate in Ketos toolsteel obtained by using rectangular tool tips having different perimeters and circular tool tips having different radii. It is shown that the pressure rather than the force maintained between the tool tip and the workpiece is pertinent in the ultrasonic machining process, and that the ratio C/A of the tool tip perimeter C to the tool tip area A is of importance. A phenomenological expression is derived which for circular and rectangular tool tips relates the machining rate in general to the pressure in general.
(G24c; TS)

221-G. Stainless Steel. Pt. 1. Its Properties and Machining. J. A. Ferree. *Automatic Machining,* v. 18, May 1957, p. 61-64.

Properties of stainless steel of straight chromium and nickel-chromium grades and influence of properties and structure on the machining characteristics.
(G17, Q general; SS)

222-G. Automated Crankshaft Line at Plymouth. Henry Ibser. *Machine and Tool Blue Book,* v. 52, Apr. 1957, p. 109-115.

Machining of SAE 1045 steel crankshafts. Milling, turning and grinding machines are loaded and unloaded from transverse and longitudinal transfer units automatically after each machine completes its cycle. (G17, 18-24; CN)

223-G. Diamond Tools. Joseph Klipper. *Machine and Tool Blue Book,* v. 52, Apr. 1957, p. 130-140.

For machining nonferrous metals requiring low tolerances and high finishes diamond tools may be economical.
(G17, 1-2; EG-a, NM-k37)

224-G. Higher Rake Angles. Key to Better Performance in Milling. J. H. Crawford and M. Eugene Merchant. *Machine and Tool Blue Book,* v. 52, Apr. 1957, p. 142-149.

Study of cutter life and surface finish for hot rolled steel in face-milling and slab-milling operations with rake angle ranging from 0 to 50° and speeds of 70 to 500 surface ft. per min. (G17b; ST)

225-G. Operations on Body Components for Ford Consul, Zephyr and Zodiac Cars. *Machinery,* v. 90, Apr. 19, 1957, p. 852-861.

Equipment for drawing and piercing steel sheet to make automobile doors; press loading and extraction equipment.
(G2j, G4, 1-2, T21a; ST, 4-3)

226-G. Experiments on Grinding. P. Landberg. *Microtecnic,* v. 11, no. 1, 1957, p. 18-26.

Waviness of the circumference of wheel and work (micro-unroundness). Roughness of the work, wheel wear and grinding forces in their possible relation to the grinding vibrations and the life of the wheel. (G18; S21)

227-G. Study of the Influence of the Addition of Sulphur on the Machinability of a Medium-Carbon Steel. Paul Bastien and Michel Weisz. *Microtecnic,* v. 11, no. 1, 1957, p. 27-32.

Mechanism by which the addition of sulphur influences machinability is suggested. 6 ref.
(G17k, 1-10; CN, S)

228-G. Belt Grinding as a Precision Production Process. Alan G. Diamond. *Western Machinery and Steel World,* v. 48, Apr. 1957, p. 112-116.

Recent developments and equipment, recommendations as to abrasive grain size, belt speed and coolant for grinding various metals; application of process to grinding problem on circular stainless steel jet engine component. (G18k; SS)

229-G. Principles and Applications of Spark Machining. Pt. II. D. W. Rudorff. *Wire Industry,* v. 24, Apr. 1957, p. 353-356; disc. p. 360.

Equipment, factors controlling rate of material removal, scope of spark erosion technique, most important being the working of hardened steels in forming irregularly shaped apertures. (G24a; ST)

230-G. (French.) **Machining of Copper and Copper Alloys. Chapters II and III. General Practice of Machining. (Continued.)** *Cuivre Laitons Alliages,* no. 36, Mar-Apr. 1957, p. 7-14.

Cutting angles, types of cutting tools, choice of cutting speeds, cutting fluids, tool wear and tool life and surface finishing with special reference to copper, bronze and zinc. (To be continued.)
(G17, Cu, Zn)

231-G. (French.) **Ultrafinish, New High-Precision Grinding Process.** T. G. Lewis. *Machine Moderne et Revue Mecanique,* no. 579, June 1957, p. 41-48.

New method of grinding-polishing gives metal surfaces an exceptional polish and also an excellent geometric finish superior to that offered by every other commercial finishing process. (G19q)

232-G. (Japanese.) **Machining Technique in Germany.** Makoto Ito. *Society of Mechanical Engineers of Japan Journal,* v. 60, Apr. 1957, p. 372-380.

Machining practice in the German bearing and wheel industries; outline of research programs in machinery technique. (G17)

233-G. How to Machine Gray and Nodular Iron. Norman Zlatin, W. H. Friedlander and Charles F. Walton. *American Machinist,* v. 101, May 20, 1957, p. 137-152.

Practical guide to machining of cast irons dealing with sharpening of cutting tools, correct tool geometry, power requirements, relation of tool life to microstructure of cast irons, factors determining surface finish, problems of distortion, use of coolant and recommendations as to speed, feed and angle of cut.
(G17; CI-n, CI-r)

234-G. Why Abrasive Belts Need Grinding Fluids. J. J. Durnan. *American Machinist,* v. 101, May 20, 1957, p. 160-161.

Role played by fluids in carrying away heat, lubricating and preventing welding. (G18; NM-h)

235-G. Forces and Power Required to Turn Aluminum and Seven Alloys. O. W. Boston and W. W. Gilbert. *American Society of Mechanical Engineers Transactions,* v. 79, May 1957, p. 909-914.

Turning tests on pure aluminum 1100-H14 and seven aluminum alloys were made to develop the formula for the tangential cutting force as a function of the material constant, the feed in inches per revolution, and the depth of cut in inches, when cutting dry, with a solid high speed steel tool ground for turning aluminum. Equations for each metal have been developed and it is shown that the constants and exponents vary for each metal.
(G17a, 1-4; Al, TS-m)

236-G. Comparative Machinability of B1113, C1213, C1120 HR, C1120 CD and C1119 Steels. H. L. Bryden. *American Society of Mechanical Engineers Transactions,* v. 79, May 1957, p. 915-919.

A report on extensive machinability tests from which C1119 steel indicated an average tool life six times greater than that of the best B1113 and C1213 steels and nine times the tool life of the average of seven varieties of B1113 and C1213 steels investigated. (G17k; CN)

237-G. Acid Etch-Milling Is in Full-Scale Production. T. M. Rohan. *Iron Age,* v. 179, May 16, 1957, p. 114-115.

North American Aviation uses hydrochloric acid for chemical milling of complex shapes in aluminum tube, sheet and forgings. Chemical milling offers promise for shaping titanium and stainless steels.
(G24b; Al, Ti, SS)

238-G. Tooling for Stainless on Automatics. W. E. McFee. *Machine and Tool Blue Book,* v. 52, June 1957, p. 99-114.

Types of stainless steels suitable for automatic screw machine work and chart of cutting rates; recommended feeds and tool compositions; characteristics of screw machine tools. (G17g, 1-2; SS)

239-G. Machining Stainless Steel at Ryan Aeronautical. Art Quinlan. *Modern Machine Shop,* v. 30, June 1957, p. 116-123.

Drilling, reaming, tapping, turning and milling stainless and other alloys. (G17; SS)

240-G. Automatic Plant Makes Aluminum Cans Faster, Cheaper. E. G. Maeder and A. V. Lovell. *Modern Metals,* v. 13, Apr. 1957, p. 36-40.

Transfer methods, equipment and plant layout used in German plant for impact extrusion and finishing of aluminum cans.
(G5, 1-2, 18-17; Al)

241-G. Deep Drawing Simplified. Kim Darby. *Modern Metals,* v. 13, Apr. 1957, p. 54-58.

Flexible diaphragm replaces female die in Hydroform process to make simple or complex parts from aluminum, steel or other sheet metals. Method cuts tooling costs and set-up time, reduces thin-out, spot stresses, springback and wrinkling. (G14b, 1-2; Al, ST, 4-3)

242-G. **Flame Cutting.** H. T. Geertson. *New Zealand Engineering,* v. 12, Mar. 15, 1957, p. 107-109.

Process and its advantages. (G22g)

243-G. **Cutting Costs With Impact Extrusion.** *Steel,* v. 140, May 6, 1957, p. 85-88.

General principles of impact extrusion and illustrations of wide variety of parts from aluminum, silver, magnesium or other metals. Use of automatic slug casting machine. (G5; Al, Ag, Mg)

244-G. **Contouring With Chemicals.** *Steel,* v. 140, June 3, 1957, p. 85-88.

Although applications of chemical milling are almost entirely in aircraft ard missile fields, it has potentialities in other industries. Basic steps, cleaning, masking, etching and stripping described. (G24b)

245-G. **Case History in Production Machining Titanium.** W. L. Carr. *Tooling and Production,* v. 23, June 1957, p. 83-85. (CMA)

The production machining of a titanium support for an aircraft engine mount is described. Good face milling is obtained with high-speed steel shell mills with 10° positive radial and axial rake or with carbide mills with neutral rakes. Cutters used in profiling are run at 500 sfpm. speed and 0.003-0.005 feed with a water-soluble coolant. Staggered tooth cutters are not used in thin-wall situation because of chatter. (G17b; Ti)

246-G. **New Concepts in Deep Drawing Produce Molybdenum Anodes of Higher Reliability.** J. M. White. *Tooling and Production,* v. 23, June 1957, p. 106, 110. (CMA)

Molybdenum anodes will overheat in thin sections when wall and end thickness is not uniform. There has been some difficulty in making a one-piece deep drawn part, the ideal anode shape. A new concept of deep drawing and more ductile molybdenum sheet has made the ideal possible. Aluminum bronze drawing dies are used; castor oil is the lubricant. (G4b, W3h, 17-7; Mo)

247-G. **Explosive Forming Socks Tough Alloys in Shape to Thwart Thermal Thicket.** *Western Metals,* v. 15, May 1957, p. 57-58.

Tests are underway at Lockheed Aircraft to examine possibilities of shock forming of high-tensile stainless steel and titanium alloys. (G general; SS, Ti, NM-k34)

248-G. (French.) **Cold Extrusion of Pieces. Mechanical Properties and Possibilities of Use.** H. D. Feldmann. *Machine Moderne et Revue Mecanique,* no. 579, June 1957, p. 57-66.

General principles underlying the cold extrusion of steel; mechanical properties of various steels; complementary treatments — machining, welding, protection against corrosion, hardening, practical examples. 11 ref. (G5; ST)

249-G. (Russian.) **Studying the Cutting Process With High-Speed Movie Camera.** S. P. Tambovtsev. *Stanki i Instrument,* v. 28, Feb. 1957, p. 19-21.

For studying the physical phenomenon of mechanical cutting with resulting chips and varying surface conditions suitable movie cameras are used. These generally expose 5000 frames per second and are capable of 360 X magnification; specimens are prepared by microgrinding the surfaces which are to be studied. (G17, X5h, 1-3)

250-G. (Russian.) **Improving the Dimensional Steadiness of Cutting Tools With Elastic Compensation.** M. A. Esterzon. *Stanki i Instrument,* v. 28, Feb. 1957, p. 24-28.

Decreasing of systematic errors appears to be the main problem in controlling dimensions in the cutting process. Compensations can be made by the number of operations or by time. Cutting force and the resulting deformation of the elastic system of the machine tool, cutters and parts may also be used. Examples are given. (G17, S14)

251-G. **Processing 20-Mm. Shell Steel Belt Links to Precise Specifications.** *Industrial Heating,* v. 24, Apr. 1957, p. 692-698.

Operations include forming, blanking, hardening in continuous furnace with controlled endothermic atmosphere, oil quenching, drawing furnace, cleaning and assembly of SAE 1055 steel belt links. (G general, J general, L12; Cr)

252-G. **Titanium Deep Drawing Characteristics.** *Light Metal Age,* v. 15, June 1957, p. 14-16. (CMA)

Research at Worcester Pressed

Steel shows that deep drawing of titanium stampings has the advantages of speed, cheapness, close tolerances, strength and versatility of shape. The drawability of C-110M and A-110AT is compared with that of commercial titanium. There is a definite advantage in heating heavier gages to get draws equal to the cold draws on lighter gages. Curves for C-110M show that best results are obtained at 1000° F., where 50% draws are made at speed of 8-24 in. per min. Hydraulic presses give better results than mechanical presses. (G4b, 17-2; Ti)

253-G. Titanium—Fabrication Tips. *Light Metal Age,* v. 15, June 1957, p. 20-21. (CMA)

Fabrication methods for titanium used by Boeing Aircraft are reviewed. Conventional methods for aluminum may be used in the drilling, milling, stretch forming and spot welding of titanium. Hot forming titanium is often easier than cold forming aluminum; Meehanite dies and a ceramic lubricant are used. Uniform high temperatures and fast forming minimize distortion and contamination. Prior to heat treatment at 1700° F., Ti-4Al-4V is sprayed with aluminum silicone. A plastic enclosure for the argon is used in fusion welding. Riveting is easy. Bonding Ti-6Al-4V skins to 17-7PH honeycomb is discussed. (G general, K general; Ti)

254-G. Performance of Carbide Cutting Tools. *Machinery,* v. 90, Apr. 5, 1957, p. 743-747.

Study of carbide tools used for cutting AISI 1020 hot rolled steel. Lists equipment, test conditions, carbide wear and influence of chipbreakers on cutting forces, tool wear and cutting temperature. (G17; SGA-j, 6-19)

255-G. Ultra-Finishing Processes for Roll Surfaces. T. Q. Lewis. *Machinery,* v. 90, Apr. 19, 1957, p. 879-884.

Lapping techniques for providing optimum finish on roll surfaces. (G19p)

256-G. Cutting Tools Made of Ceramics. *Metal Progress,* v. 71, June 1957, p. 111-113.

Ceramic tool tips are usually made of cemented aluminum oxide, and are most valuable for uninterrupted finishing cuts on cast iron, and for machining hardened alloys or others unduly abrasive to carbide tools. Optimum tool geometry, developed by laboratory research, has been confirmed by production experience. (G17, T6n; SGA-j, 6-20).

257-G. Ceramics in Turning Defined by Research in Application and Use. *Metal Removing,* v. 1, Apr.-May 1957, p. 8-12.

Results of tests comparing carbide and ceramic tools for turning 4150 steel; suggestions for applications of ceramic tools; their proper design and use. (G17a; SGA-j, 6-20)

258-G. Martin Tests Ceramic Tools. *Metalworking Production,* v. 101, Apr. 5, 1957, p. 587-588.

Results of tests at Martin Co. using ceramic tools to cut and mill SAE 4130, SAE 4340, SAE 4340 and SAE 4335 with vanadium. (G17; SGA-j, 6-20, AY)

259-G. Tooling for Precision Presswork. J. Galway. *Metalworking Production,* v. 101, June 7, 1957, p. 967-975.

Multi-stage tooling of dieing presses reduces labor costs and results in cheaper and faster production. Cites examples. (G1)

260-G. Microfinish Gives Greater Economy. *Metalworking Production,* v. 101, June 14, 1957, p. 1019-1022.

Advantages of superfinishing technique; aspects of the process and details of Thielenhaus Microfinish continuous centerless machine. (G19q, 1-2)

261-G. Progress Report on Ceramics. Pt. 7. Why Ceramic Tools Can Cut Faster. Arthur G. Metcalfe. *Metalworking Production,* v. 101, June 14, 1957, p. 1023-1024.

Differences in tendency of chips to weld to tool tip are major reason why ceramic tools can operate at higher temperatures. (G17; SGA-j, 6-20)

262-G. New Flame-Cutting Machines in Shipbuilding. R. Bechtle. *Shipbuilder and Marine Engine-Builder,* v. 64, May 1957, p. 334-337.

Machines described are large and relatively heavy stationary types used for making straight cuts to prepare the edges for welding and for producing curved cuts. The first principle of construction is weight—adequate weight to afford stable and accurate operation for a long time, even under the most adverse conditions. The driving mechanism of the flame-cutting machine has to be designed with the severe working conditions prevailing in shipyards in mind. (G21g, 1-2)

263-G. What Makes a Good Deep Drawing Steel? *Steel,* v. 140, Apr. 22, 1957, p. 78-79.

General Motors' standards based on mechanical property rating, grain size and number of inclusions; surface classifications to be used in selecting cold rolled sheet for drawing. (G4b, 17-2, S22; ST)

264-G. Shot Peening. *Steel Processing and Conversion,* v. 43, May 1957, p. 260-266.

General principles and applications of shot peening. Table of S.A.E. standard shot numbers; information on air blast and centrifugal blast systems with their relative advantages; methods of shot reclamation and measurement of degree of intensity of peening. (G23n)

265-G. Thread Rolling Improves Part Quality—Cuts Production Costs. Clifford T. Appleton. *Tool Engineer,* v. 38, May 1957, p. 87-92.

Characteristics of thread rolling, methods and machines, thread rolling dies, preparation of blanks, preferred forms for rolling and various applications. (G12)

266-G. Applying Ceramics to Production. Alfred O. Haeme and Robert T. Hook. *Tool Engineer,* v. 38, May 1957, p. 100-104.

Data from production tests of ceramic tools for single point turning and the milling of steel parts. (G17a, G17b; SGA-j, 6-20)

267-G. Improved Cold Extrusion Sequence Reduces Material and Labor Costs. Hubert J. Pessl. *Tool Engineer,* v. 38, May 1957, p. 109-112.

Experimental work on cold extrusion of shells shows that diameter of billet need be no larger than diameter of finished product. (G5)

268-G. New Concepts in Deep Drawing Produce Molybdenum Anodes of Higher Reliability. James M. White. *Tooling and Production,* v. 23, June 1957, p. 106-110.

The electronic tube anode deep drawn from sheet molybdenum. Aluminum bronze drawing dies, castor oil lubricant and more ductile material are reasons for success. (G4b, 1-2, W3h, 17-7; Mo)

269-G. Designs of the Future With Chemical Milling. C. L. Hibert. *Western Machinery and Steel World,* v. 48, May 1957, p. 98-101.

General aspects and principles of metal removal by chemical milling; advantages in design of certain aluminum and titanium parts; specific applications and limitations of process. (G24b; Al, Ti)

270-G. Modified Skin Mills Precisely Sculpture Honeycomb Skin Panels. *Western Metals,* v. 15, Apr. 1957, p. 52-53.

Skin mills with especially equipped tables used for milling aluminum alloy sheets to be used as sandwich skin on jet plane components. (G17b, 1-2, T24a)

271-G. (English.) **Analytical Study on Grinding Temperature.** Kenji Sato. *Tohoku University, Technology Reports,* v. 21, 1957, p. 72-106, 255-290.

Proportion of heat conducted to the work. The chip and the wheel were studied experimentally and analytically in the case of SF-54 steel, grinding with an aluminum oxide wheel without coolant. Verification of analytical theory by temperature measurement and by work-wheel thermocouple method. 13 ref. (G18, S16)

272-G. (German.) **Grinding of Hard Metals.** Siegfried Buchner. *Metallwaren-Industries und Galvanotechnik,* v. 48, May 1957, p. 216-218.

Grinding wheels and abrasives are discussed with a tabulation of abrasives used in the various, stages of grinding of specified materials. (G18; NM-j)

273-G. Hot Dies Make A-110-AT Titanium Behave. B. C. Kimbell. *American Machinist,* v. 101, July 15, 1957, p. 128-129. (CMA)

A-110AT may be drawn into cups by using a die designed by Worcester-Pressed Steel. Slow drawing speeds and heated dies are required. The die developed consists of a draw ring of pearlitic iron cast around heating elements, a Supermica 500 washer, and a horseshoe-shaped base. (G4c, W24n, 1-2; Ti)

274-G. Drilling of 6Al-4V Titanium Alloy G. P. Campbell and A. Searle. *American Society of Mechanical Engineers, Preprint 57-SA-71.* Apr. 8, 1957. 7 p. (CMA)

Tests to discover recommendations for drilling of Ti-6Al-4V. Very sharp cutting edges are required. Fine machine-ground points give more holes per grind than rough or hand-ground drills. Drills should be changed at the first sign of dulling; rotation of the drill without cutting causes rapid dulling. Speeds

of 20-30 sfm. give the best tool life for drills of the M-10 and M-36 alloy steel type. The short NAS 907, Type-C drill is best for sheet. Drill geometries are also recommended. Axial thrust forces are high for titanium. (G17e; Ti)

275-G. Automation Aids Steel Cabinet Forming. H. R. Neighbours. *Automation,* v. 4, June 1957, p. 94-96.

Description of automation applied to press operations at the Whirlpool-Seeger plant in the manufacturing of laundry dryer cabinets. (G1, 18-24; ST)

276-G. Stretching and Drilling Techniques for the Jet Age. Ray Ortiz. *Machinery,* v. 63, June 1957, p. 155-157.

Description of a special drilling machine and a radial draw former which will be used in stretch-forming stainless steel and titanium for jet sections and parts. (G9, G17e, 1-2; SS, Ti)

277-G. Heat—the Key to Forming Titanium. E. A. Wooden and T. P. Iodice. *Machinery,* v. 63, July 1957, p. 154-159. (CMA)

Martin Co. (Baltimore) forms titanium parts with small radius bends and intricate contours without fear of fracture or distortion by controlled heating. One method uses individual blocks to raise the temperature of the work; 50 to 100 such blocks of individual design are used to produce the P6M Seamaster; heating units are built in. Facilities for 15 units are provided by the control panel. Temperatures as low as 300-400° F. have proved adequate in stretch-forming. In drop-hammer forming the titanium workpiece is resistance heated; the die surface is electrically insulated with liquid cement. Forming operations. (G9, F22n, F21b; Ti)

278-G. Titanium Formed at Ford by Heating, Rolling, and Exploding. C. H. Wick. *Machinery,* v. 63, July 1957, p. 184-189. (CMA)

Techniques for forming titanium for jet engine parts. Inlet guide vanes are formed from titanium blanks with an electrical resistance-heated die, seam welded and finish formed by explosion restriking. Details of the latter procedure are described. Heated upset blanks are roll-forged to compressor blades on a modified vertical hydraulic press. (G23, G11; Ti)

279-G. Milling With Chemical. Gilbert C. Close. *Metal Products Manufacturing,* v. 14, June 1957, p. 46-48, 91.

Advantages of "chemical milling" process are: parts can be formed and heat treated prior to milling; several parts can be chemically milled at one time; shapes can be milled chemically that would be impossible to mill by any known conventional set up. (G24b)

280-G. Electrical Discharge Form Grinding Carbide-Tipped Broaches. Ping Ianitelli. *Modern Machine Shop,* v. 29, May 1957, p. 114-115.

Carbide-tipped form broach machined to size by electrical discharge method. (G24a, T6n; 6-19)

281-G. Working Pressures for Drawing Operations. *Production,* v. 39, June 1957, p. 111.

Chart based upon a free draw with no ironing and burnishing and upon a maximum reduction (nearly 50%). (G4, 3-24)

282-G. Hot Finish-Forming. J. L. Bayer and W. W. Wood. *Product Engineering,* v. 28, July 1957, p. 146-149. (CMA)

Hand-working titanium into shape is expensive because of poor resistance to buckling and forming. Stress-relief is therefore needed to control the final shape and to remove residual stress and the drop in compression yield strength subsequent to stretch-forming. Chance-Vought has developed a hot-forming method to eliminate these difficulties, based on the use of electrically heated (to 950° F.) marinite-insulated dies. Either standard or special presses are used and several different dies may be accommodated at once. The cycle is 2-min. dwell time before and 3-min. after clamping, and 1 min. for reloading. Parts formed are categorized as single-stage forming from flat blank, two-stage forming from straight section, and three-stage forming from curved section. A formability chart shows where stress-relief is needed. (G1, 1-2, 1-16, Q23q; Ti)

283-G. Flaring of Zirconium End Adapters. A. J. Ciancetta. *U. S. Atomic Energy Commission,* KAPL-M-RCD-30. 7 p. (CMA)

A zirconium end adapter is flared in two operations, first with a 20° die and later with a 47° die. Requirements of finish, wall thickness and annealing are set forth. Study shows that the adapter design under consideration can be flared satisfactorily. (G6d, T11, 17-7; Zr)

284-G. (French.) **Something New—One-Operation Impact Extrusion With the Comocast Casting Machine.** D. Y. Gastoué. *Revue de L'Aluminium,* no. 243, May 1957, p. 540-541.

To further improve the exceptional low-cost possiblities of impact extrusion, efforts have been aimed at obtaining the slugs as economically and quickly as possibile with a high-grade metal. In this field, a new machine, the Comocast, has just been introduced on the U. S. market. This machine, due to special tooling, casts the slugs under excellent conditions. (G5, 1-2)

285-G. (French.) **Industrial Possibilities of Impact Extrusion.** Maurice Victor. *Revue de L'Aluminium,* no. 243, June 1957, p. 535-540.

Impact extrusion, either inverted or with the Hooker direct process, provides the possibility of producing economically and at a fast rate not only collapsible tubes, but also mechanical parts which can be both large and intricate and even embody inner walls or tubes. (G5)

286-G. Continuous-Dress Grinding. Anderson Ashburn. *American Machinist,* v. 101, May 6, 1957, p. 113-115.

Combination of diamonds in a roll and special hydraulic feed make it possible to dress wheels while they are grinding for a new level of automation. (G18)

287-G. Progress Report on Tapered-Skin Belt Grinder. Joseph R. Burns. *American Machinist,* v. 101, June 17, 1957, p. 130-133.

Units of 250 hp. for finishing flat and tapered aircraft skins have been used for finishing aluminum skin and plate, stainless steel sheet, cast steel boiler plate, titanium, magnesium and other parts.
(G18k, 1-2; Al, SS, ST, Ti, Mg)

288-G. Analysis of Residual Stress in Ground Surface of High-Temperature Alloys. R. D. Halverstadt. *American Society of Mechanical Engineers.* Paper no. 57-Sa—62, 12 p.

Residual stress caused by grinding high-temperature alloys has proved to be a troublesome problem both from a standpoint of distortion of the parts and from reduced endurance limits. A complete analysis was made which measured the effect of grinding-wheel speed, grinding-wheel hardness, grinding fluid, down feed, and work speed on the residual-stress level in the surface of three alloys used in modern aircraft gas-turbine design. The results of the study show that stresses can be minimized by using lower wheel speeds and down feeds, increasing work speed, and using a sulphurized oil as the grinding fluid. 6 ref. (G18k, Q25h; SGA-h)

289-G. Shear-Zone Temperature in Metal Cutting and Its Effects on Shear-Flow Stress. Dimitri Kececioglu. *American Society of Mechanical Engineers,* Paper no. 57-Sa—70, 7 p.

Relationships are given from which the mean shear-zone temperature in oblique, as well as in orthogonal cutting, can be calculated. The mean shear-zone temperature, developed when machining SAE 1015, 118 Brinell seamless steel tubing under a wide range of cutting conditions, is calculated and is found to vary from about 410 to 840° F. The effect of the mean shear-zone temperature on the mean shear-flow stress is studied. (G17k, 1-11; CN)

290-G. Making and Polishing Stainless Steel Automobile Roofs. *Automotive Industries,* v. 117, June 1, 1957, p. 56-57.

Major part of the roof panel is formed from 72-in. wide sheets of AISI Type 302 stainless. Two extensions or ears are gas welded to the main panel. (G1, T21a; SS)

291-G. Stainless Steel. Pt. 2. Drilling. J. A. Ferree. *Automatic Machining,* v. 18, June 1957, p. 64-66.

Information on equipment, drill preparation and design, drilling lubricant, drilling speed for several stainless steels. (G17e; SS)

292-G. Castings Machine Better With Water Coolants. W. G. Patton. *Iron Age,* v. 179, June 20, 1957, p. 102-103.

Water soluble coolants are advantageous from the standpoint of economy, cleaner plant and easier chip disposal. (G17; MN-h, 5)

293-G. Tips on Machining Stainless. *Iron Age,* v. 180, July 25, 1957, p. 114-121.

Whether the job involves turning, drilling, tapping, milling or reaming, pointers are given which will make the job easier and more efficient. (G17; SS)

294-G. Machining Standard Steels. *Iron Age,* v. 180, July 25, 1957, p. 122-128.

Techniques to achieve high quality consistent with lowest price.
(G17; ST)

295-G. Operations on Body Components for Ford Consul, Zephyr and Zodiac Cars. *Machinery,* v. 90, May 24, 1957, p. 1158-1166.

Operations and machines used in forming, drawing, spot and seam welding of steel sheets for front fenders of British Fords.
(G1, G4, K3n, K3p, 1-2, T21a; ST)

296-G. Results Obtained With High-Rake Milling Cutters. J. R. Varnak. *Mdchinery,* v. 90, June 7, 1957, p. 1269-1273.

High speed steel milling cutters with high-rake angles make possible increases in speed and feed in slotting for plain slab milling provided ample coolant is supplied; experiments on SAE 8620, SAE 4815, SAE 4140 steels and bronze.
(G17b, 1-2; AY, Cu-s)

297-G. Broaching Titanium. L. B. Gray. *Machinery,* v. 63, Aug. 1957, p. 135-141. (CMA)

Broaching, often considered the most troublesome operation in machining titanium, has been easily performed at Orenda Engines with carefully designed broaches made from 18-4-1 high speed steel. Solid-type broaches are used for roughing and the insert type for finishing. (G17d, 1-2; Ti)

298-G. Metalworking by Spark-Erosion. Pt. 1. *Metalworking Production,* v. 101, June 21, 1957, p. 1067-1071.

Practice and theory with particular emphasis on Agietron method, which is expained with reference to other known methods. (G24a)

299-G. Machining Properties of Iron Castings. Norman Zlatin, W. H. Friedlander and Charles F. Walton. *Metalworking Production,* v. 101, July 12, 1957, p. 1201-1208.

Effect of microstructure on tool life; factors influencing surface finish and causes for distortion.
(G17k, 3-21; CI)

300-G. A Two Component Lathe Dynamometer. B. L. Ten Horn and R. A. Schurmann. *Microtecnic,* v. 11, no. 2, 1957, p. 59-66.

Machinability evaluation based on cutting forces. Describes a two-component dynamometer giving both the main and tangential force component and the feed or axial force component. (G17k, 1-4)

301-G. New Light on Grinding Fluids. *Steel,* v. 141, July 15, 1957, p. 127-136.

Research at Mellon Institute indicates that lubrication is more important than cooling. Grinding experiments were done in air, two concentrations of rust inhibitor in water, six water soluble oils and four straight grinding oils. (G18, NM-h)

302-G. Turk's-Heads Shape Production Parts. *Steel,* v. 140, June 17, 1957, p. 104-106.

Operating like small rolling mills, these adjustable arrangements of rolls shape variety of cross sections from wire and strip of a large range of materials including high-alloy and toolsteels and titanium.
(G11; AY, TS, Ti, 4-3, 4-11)

303-G. Impact and High-Velocity Forming. R. W. Peters. *Tool Engineer,* v. 39, July 1957, p. 83-86.

Note on possibility of shot forming aluminum, stainless steel and titanium with explosives.
(G general, 1-2; Al, SS, Ti, NM-k34)

304-G. Cold Forming Improves Tubular Parts. William J. Sprigings. *Tool Engineer,* v. 39, July 1957, p. 116-118.

Cold forming of thin-wall stainless steel tubing for use in aircraft components found more simple than halfshell stamping and welding methods of manufacture.
(G general, 1-17; SS, 4-10)

305-G. Methods and Procedures for Special Tube-Bending Applications. R. J. Reardon. *Western Machinery and Steel World,* v. 48, June 1957, p. 108-109.

Techniques in bending tapered or swaged tubing. (G6; 4-10)

306-G. Mechanism of Action of Lubricants in the Working of Metals. S. Ya. Veiler, V. I. Likhtman and P. A. Rebinder. *Doklady Akademii Nauk,* v. 110, 1956, p. 985-988. (*Henry Brutcher Translation* no. 3943).

Action of lubricants in metalworking in terms of reduction of thickness and build-up ("plastic wave") in front of the tool, and of rendering surface layers more amenable to plastic deformation. Specific advantages of surface-active lubricants in regard to their action on surface of metal, its elastic recovery, stress state and surface quality.
(G general; NM-h)

307-G. (French.) **Machining of Copper and Copper Alloys. Pt. 3 and 4. General Practice of Machining. (Continued.)** *Cuivre Laitons Alliages,* no. 37, May-June 1957, p. 7-14.

Functions served by cutting fluids; enumeration of various types; their application and factors determining their selection; turning, surfacing, profiling, milling of copper alloys; lathes and equipment employed. (G17, 1-2; Cu, NM-h)

308-G. (German.) **Reducing by Cold Drawing.** H. Gross and R. Beck. *Fertigungstechnik,* v. 7, Feb. 1957, p. 57-62.

Forming methods; limits of formability by reducing; effect of shape; properties of material; notch effect; sheet clamping and clamping angle; friction; reducing tools; simple and multiple hydraulic drawing presses; special reducing machines. 49 ref. (G4, 1-17)

309-G. (German.) **Shaping of Sheet Steel With the Aid of Rubber.** H. Gross and R. Beck. *Fertigungstechnik,* v. 7, Mar. 1957, p. 115-119.

Basis for rubber methods; comparison with other process; requirements for shaping with rubber; Guerin, Marform, hydroform deep drawing, Hidraw and Wheelon methods. 55 ref. (G14; ST, 4-3)

310-G. (German.) **Photometric Determination of Arsenic in Commercial Iron With Silver-Diethyl-Dithiocarbamate.** Z. Vecera and B. Bieber. *Giessereitechnik,* v. 3, Mar. 1957, p. 61-64.

Basic method, apparatus, solutions and reagents, plotting of calibration curve. 6 ref. (S11a; Fe, *As*)

311-G. (Japanese.) **Durability of Drills in Machining High-Quality Cast Iron.** Makoto Okoshi, Naoharu Kinoshita and Takao Sakuma. *Scientific Research Institute, Reports,* v. 33, no. 3, May 1957, p. 124-136.

Determination of durability; effect of pressure; cutting speed; comparison of types of drills. (G17e, 1-2; CI)

312-G. (Russian.) **Introduction to Ceramic Tools.** O. E. Gelfand and S. B. Futorian. *Vestnik Mashinostroeniia,* v. 37, Apr. 1957, p. 50-56.

Methods of holding ceramic bits in lathe tools and in milling cutters. Extensive data are furnished on their application and performance. (G17, T6n, 17-7; 6-20)

313-G. (Russian.) **Method for Calculating Temperature Produced by Grinding.** A. I. Isaev and S. S. Silin. *Vestnik Mashinostroeniia,* v. 37, May 1957, p. 54-59.

By calculations developed in this article it is possible to avoid high temperatures in grinding operations which are likely to produce burring, cracks and residual tension. (G18, 2-12)

314-G. (Russian.) **Working Hard Alloys by Electro-Abrasive Means With Graphite Filling.** I. K. Trushin. *Vestnik Mashinostroeniia,* v. 37, May 1957, p. 59-61.

This method is cheaper and as satisfactory as that produced by the use of ceramic, carbide and diamond. A rotating wheel is impregnated with graphite, and this is the cathode; the anode is a film formed by the electrolyte on the surface of the work. Gages made by this method have surfaces with mirror finish. (G24d)

315-G. (Russian.) **The Effect of Grinding on the Strength of Heat Treated Parts.** D. C. Elenevski. *Vestnik Mashinostroeniia,* v. 37, May 1957, p. 65-69.

A study of the effect of grinding on various test pieces. It is recommended that those portions of the work which are most likely to be weakened by grinding should be ground before heat treatment. In the event that this is not feasible, grinding should be held to a minimum by precise machining. (G18, Q27a; 14-18)

316-G. **Stainless Steel Pt. 3. Reaming and Tapping.** J. A. Ferree. *Automatic Machining,* v. 18, July 1957, p. 42-48.

Speeds, feeds, tools, equipment and lubricant in reaming and tapping of free-machining grades, straight chromium grades and chromium-nickel grades of stainless steels. (G17e, G17f; SS)

317-G. **Stainless Steel. Pt. 4. Threading.** J. A. Ferree. *Automatic Machining,* v. 18, Aug. 1957, p. 39-42.

Tooling, die design and material, hardness of stock, speed, roughing and finishing procedures for various stainless steel grades. (G17f; SS)

318-G. **Shortcut to Long Runs: Heavy Duty Steel Rule Dies.** E. K. Scott. *Iron Age,* v. 180, July 4, 1957, p. 80-81.

Note on use of steel rule blanking dies for stamping variety of steel, aluminum, copper or brass sheet parts; die life. (G3, W24n, 1-2; Al, Cu, ST)

319-G. Designing for Chemical Milling. R. W. Beckim. *Machine Design,* June 13, 1957, p. 153-156.

List of conditions where chemical milling is advantageous and some design suggestions. (G17b)

320-G. Machining Heat-Resistant Alloys. R. D. Halverstadt. *Machine Design,* June 13, 1957, p. 163-168.

Machinability follows the general order of high-temperature strengths with some notable exceptions. Relationship between design, machining and milling problems.
(G17k, SGA-h)

321-G. Sub-Zero Machining and Quenching. R. J. Delaney. *Machinery,* v. 63, July 1957, p. 148-153.

Variations of subzero treatment followed by Douglas Aircraft: dip process after heat treatment; supplying subzero coolant during machining; subzero and boiling water treatment. (G17, 2-13, J26)

322-G. Integrally Stiffened Wing Panels Formed by Shot-Peening Kenneth Sparling. *Machinery,* v. 63, July 1957, p. 170-173.

Advantages of shot peen forming over hot bending methods. Curvature is controlled by altering peening intensity and degree of saturation.
(G23n)

323-G. Splines Formed Ten Times Faster by Cold-Rolling. Miles Etzel and C. E. Kopp. *Machinery,* v. 63, Aug. 1957, p. 165-167.

Cold rolling of splines in hardened and ground AISI type-410 stainless steel. (G11, 1-17; SS)

324-G. Spinning Broadens Uses of Titanium. *Modern Industrial Press,* v. 19, Mar. 1957, p. 37. (CMA)

Lukens Steel Co. has successfully formed a "head" of solid titanium with spinning equipment. The successful use of spinning equipment opens the possibility of fabricating larger titanium components at lower cost. Rem-Cru A-55 plate was spun at 600° F., using a plate previously heated to 1400-1450° F. (G13; Ti)

325-G. Machining Stainless Steel. G. J. Stevens. *Modern Machine Shop,* v. 30, July 1957, p. 142.

Single chip-breaker groove on one lip of drill increased tool life in drilling hardened stainless shafts.
(G17e; SS)

326-G. Coated Abrasives in Metal Finishing. J. Zoethout. *Product Finishing,* v. 10, July 1957, p. 53-58, 120.

Advantages of grinding with abrasive belts for both ferrous and nonferrous industry; applications such as grinding, fininshing and polishing castings; weld removal, centerless grinding, backstand polishing, grinding of automobile bumpers, wrenches, pliers, tableware.
(G18, 1-2; NM-j)

327-G. Chemical Milling and Contour Machining in Aircraft Production. Andrew L. Forrester. *Sheet Metal Industries,* v. 34, May 1957, p. 336-340, 352.

Chemical milling of aluminum alloys as practiced by American aircraft industry. Contour milling machines of titanium and aluminum.
(G24b, G19; Al, Ti)

328-G. Manufacture of Deep-Drawn Aluminium Containers. F. H. Barker. *Sheet Metal Industries,* v. 34, June 1957, p. 449-454.

Operations and equipment in forming and deep drawing aluminum food containers. (G4b; Al)

329-G. Manufacture of 40-Gallon Oil Drums. A. K. McLeod. *Sheet Metal Industries,* v. 34, July 1957, p. 495-501.

Trimming, bending, spot and seam welding, flanging, corrugating, end forming, testing machines and operations in production of steel drum.
(G general, K3n, K3p; ST)

330-G. Rolls Forge Precision Parts. *Steel,* v. 141, July 8, 1957, p. 97-100.

Products from grade rolling include cutlery, springs, automobile axle shafts; other contour rolling mills have been used to roll forged stainless and titanium compressor blades. (G11)

331-G. Complex Shapes at Bargain Rates. *Steel,* v. 141, Aug. 12, 1957, p. 124-126.

Hydroforming process with flexible diaphragm, in place of conventional female die, forms variety of ferrous and nonferrous parts with minimum tooling costs. (G14b)

332-G. Production Drilling and Reaming of Precision Holes. Herbert Gregg. *Tooling and Production,* v. 23, July 1957, p. 71-74.

Results of production runs on stainless steel and cast iron parts using trepanning-type drills and high-pressure coolant fed through the tool. (G17e; SS, CI)

333-G. Choose With Care Your Press Drawing Lubricants. Leon Salz. *Tooling and Production,* v. 23, July 1957, p. 87-91.

Classification, description, industrial requirements and recommendations. (G1; NM-h)

334-G. Applications of Chem-Mill to Airframe Structures. L. G. Hall. *Tooling and Production,* v. 23, Aug. 1957, p. 98-100.

Process has limitations, but has a wide range of adaptability. Aluminum, titanium, magnesium and many alloy steels may be etched. (G24b; Al, Mg, AY)

335-G. (Russian.) **Wear of Ceramic Tips on Fine Machining of Cast Iron.** V. A. Kacher. *Stanki i Instrument,* v. 28, Apr. 1957, p. 25-28.

Tip wear as a function of speed and depth of cutting presented graphically. Ceramic tips perform much better on cast iron than tips made of high-grade toolsteel. (G17, Q9n; CI, 6-20)

336-G. Preparation of Microsections of Cemented Carbides Without Diamond Wheels. I. K. Trushin. *Zavodskaya Laboratoriya,* v. 22, no. 7, 1956, p. 810-811. (*Henry Brutcher Translation* no. 4012.)

Previously abstracted from original. See item 355-G, 1956. (G17; SGA-j)

337-G. Depth of Strain-Hardened Layer Produced by Shot Peening. N. A. Petrova and M. Ya. Shashin. *Vestnik Mashinostroeniya,* v. 36, no. 11, 1956, p. 47-50. (*Henry Brutcher Translation* no. 4024.)

New, universally applicable (routine) method of testing the quality of shot peening and the depth of the compressed layer, based on the change in the electrical and magnetic properties of metals owing to plastic deformation of their surface. Agreement between results of proposed method and those of microhardness measurements and X-ray analysis. Correlation between depth of compressed layer on various steels and diameter of parts shot peened. (G23n, 1-4)

338-G. (French.) **A New Energy Diagram of the Formation of a Metal Chip.** Felix Eugene. *Comptes Rendus,* v. 244, Feb. 11, 1957, p. 853-856.

Curves as determined by test cuts with high speed steel tools on tempered steel. (G17k; ST)

339-G. (French.) **A Metallographic Study of Chip Formation.** Michel Weisz. *Institut de Recherches de la Siderurgie, Publication,* Ser. A, no. 142, Feb. 1957, 204 p.

Mechanical tests and metallographic techniques were used to study mechanism of deformation and preferred orientation of chip. Comparison of state of consolidation of chip produced by machining and state induced by tensile stress, plastic deformation, pure torsion, torsion plus compression, in conventional tests. Formation and stability of built-up edge during machining of killed mild steel, light alloys, stainless steel. Influence of sulphur on machinability. 43 ref. (G17k, M27)

340-G. (German.) **Hot Cold Drawing.** H. Cross. *Fertigungstechnik,* v. 7, Jan. 1957, p. 1-6.

Drawing with increased temperature in the upsetting zone (Stauchzone); a water-cooled drawing ring and drawing punch result in lower deformation resistance and greater tensile strength in the water-cooled areas. This method permits a drawing ratio of 0.23 with light metals and 0.30 with steel sheet. 6 ref. (G4, Al, ST)

341-G. (German.) **Use of the Hydraulic Press in the Stretch-Forming of Automobile Bodies.** W. Salzer. *Fertigungstechnik,* v. 7, Jan. 1957, p. 6-7.

Use of wooden dies clad with sheet metal for smaller amounts of light metal, and cast iron dies for larger amounts in stretch-forming of body parts. (G9, 1-2, T21a)

342-G. (German.) **Grinding in Foundries with Heavy Grinding Machines.** Bernhard Dahlem. *Giesserei,* v. 44, July 4, 1957, p. 411-413.

Peripheral speed; grinding efficiency and diameter of the grinding wheel; efficiency and cost of abrasives; safety of operation. (G18)

343-G. (German.) **How to Apply the Blast Lapping Method.** E. Klüppelberg. *Werkstatt und Betrieb,* v. 90, July 1957, p. 441-443.

Methods of blast lapping; present applications; lapping of workpieces, improvement of surface finish, deburring and the pretreatment of surfaces. 5 ref. (G19p)

344-G. (Italian.) **Experimental Research on "Hindered" Chip Formation During Orthogonal Turning.** Giulio Fornasini. *Ingegnere,* v. 31, Apr. 1957, p. 301-309.

Examination of theories intended to solve the problem of machinability of metals through study of chip formation during free orthogonal turning. Explanation of "hindered"

turning as that which occurs when tool with two cutting edges removes stock simultaneously, under given setting conditions, the formation of chip no longer being "free" because the portions of removed metal get in each other's way. Experimental machining of cylindrical piece of case-hardened alloy steel, 80ϕ x 600 mm., with tungsten carbide-tipped tool, provided basis for determining limits of validity of theories on "free" turning when applied to "hindered" turning. 9 ref. (G17k)

345-G. (Polish.) **Drawing Force for Solid, Round Profiles.** J. Bazan. *Hutnik,* v. 24, May 1957, p. 186-192.

A new formula is proposed, based on the theory of plastic deformation. A formula is also presented for ideal drawing conditions. Values computed according to the formulas are compared with experimental results. 5 ref. (G4, Q24)

346-G. (Russian.) **Heat Balance in Titanium BT2 Alloy Cutting.** A. M. Danelan. *Vestnik Mashinostroenia,* v. 37, Jan. 1957, p. 39-43.

A method of heat measurement is described. The relationship of the alloy and shavings temperature to speed of cutting is established. Proportion of the heat contained in the shavings increases with the speed of cutting. In comparison with the steel, the temperature of the alloy is twice as high at the same speed of cutting and the temperature of the cutting tool 3 or 4 times as high. To overcome the conditions a lubricant possessing good cooling properties is recommended. (G17, P11k; Ti)

347-G. (Russian.) **Thermal Deformation of Tools on Cutting Cast Iron.** V. I. Ishutkin. *Vestnik Mashinostroenia,* v. 37, Mar. 1957, p. 44-46.

The relationship of thermal elongation of the cutting tool and the speed and depth of cutting as well as hardness of the cast iron is presented graphically. The elongation increases 80-95 meters per min. Formula for computation of thermal deformation tool. (G17, P10d; CI)

348-G. Russians' "Punch-Less" Drawing Requires Fewer Operations. N. A. Maslennikov. *American Machinist,* v. 101, July 1, 1957, p. 81-84. (From *Vestnik Mashinostroeniia,* v. 36, 5, p. 59-63.)

Previously abstracted from original. See item 341-G, 1956. (G4, Al)

349-G. Two-Way Squeeze Makes Precise Aircraft Members. *American Machinist,* v. 101, July 1, 1957, p. 88-89.

Aluminum alloy channels and curved, flanged bulkheads preformed in conventional rubber forming press, then compression formed in die with rubber die insert giving close tolerances to flange angle and mold life. (G14a, T24a, 17-7; Al)

350-G. How to Abrasive Finish Cast Iron. Charles F. Walton. *Machinist,* v. 101, July 1, 1957, p. 93-96.

Surface, cylindrical, centerless and internal grinding methods; types of abrasive wheel, grit size and speeds for grinding cast iron. (G18, 1-2; CI)

351-G. Five Good Reasons for Abrasive-Belt Grinding. Alan G. Diamond. *American Machinist,* v. 101, Aug. 26, 1957, p. 106-107.

Advantages of using abrasive belt for grinding rib projections in stainless steel, ring assembly of jet engine. (G18k; SS)

352-G. Cutting Speeds for Oxide Tools. *American Machinist,* v. 101, July 1, 1957, p. 115.

Chart showing relationship between Brinell hardness of work and appropriate cutting speed for ceramic tools.
(G17; Q29a; SGA-j, 6-20)

353-G. Fundamentals of Ultrasonic Machining. Patrick J. Duran. *American Machinist,* v. 101, Aug. 26, 1957, p. 114-116.

Ultrasonic machining depends on transducer for converting electrical energy into mechanical vibration and vibrating tool with small amounts of abrasives for cutting through such materials as tungsten carbides and hardened toolsteel. (G24c)

354-G. Machining MST 6Al-4V Titanium. N. Zlatin, et al. *American Machinist,* v. 101, Aug. 26, 1957, p. 135, 137, 139. (CMA)

High-speed steel tools are recommended for turning, milling, drilling, tapping and band sawing Ti-6Al-4V. Carbide tools are suitable for turning and milling. Tool geometries are recommended for both tool materials. Results of machining tests are tabulated for Ti-6Al-4V bar and sheet in various conditions of heat treatment. (G17; Ti)

355-G. Surface Grinding. Horizontal Spindle-Reciprocating Table. Pt. 2. *Grinding and Finishing,* v. 2, Apr. 1957, p. 37-42.

Fundamentals applying to production operations; maintenance of

grinding machines, grinding stress and coolants. (G18k, 1-2)

356-G. Jet Blade Finishing. J. Karl McLaughlin. *Grinding and Finishing,* v. 2, Apr. 1957, p. 48-53.

Specialized techniques for production finishing of jet blades, stator blades, jet buckets and nozzle diaphragms. (G18; T7h)

357-G. Surface Grinding. Pt. 4: Wheel Selection, Forming, Dressing. *Grinding and Finishing,* June 1957, p. 45-51.

Factors influencing selection; wheel preparation and forming methods. (To be continued.) (G18k, 1-2)

358-G. Trepanning: Faster Holes With Fewer Chips. E. J. Egan, Jr. *Iron Age,* v. 180, Aug. 15, 1957, p. 91-93.

Advantages of trepanning for boring long holes through variety of alloy steels. (G17d; AY)

359-G. Lead in Cast Steel: How Much Does Machinability Improve? W. J. Phillips and D. B. Barron. *Iron Age,* v. 180, Aug. 15, 1957, p. 102-103.

Steel castings containing from 0.12 to 0.20% lead have higher machinability ratings and give improved finish compared to similar nonleaded steels. (G17k, 2-10; ST, *Pb,* 5-10)

360-G. Add Copper to Make Steel Bars More Machinable. *Iron Age,* v. 180, Aug. 22, 1957, p. 112-114.

Controlled amounts of copper in C1144 cold drawn steel improve machinability, wear properties and corrosion resistance. Mechanical properties are not adversely affected. (G17k, Q9n, R general, 2-10; ST, *Cu*)

361-G. New Performing Method Cuts Light Metal Stamping Costs. John Straw. *Light Metal Age,* v. 15, Aug. 1957, p. 12-14.

"Prestressing" sheet metal blank allows subsequent hammer forming with minimum tooling. New (Engel) process uses an elastomeric pattern and impression to determine the areas and volume of materials to be displaced for easy forming, and to incorporate appropriate deformation details in inexpensive set of preforming dies. (G3; Al, Mg)

362-G. High Tensile Materials Call for New Machining Methods. John A. Zura. *Machine and Tool Blue Book,* v. 52, Sept. 1957, p. 140-147.

Tips on choosing carbide grades and tool geometry for machining materials of 180,000 to 320,000 psi. (G17; SGA-j, SGB-a)

363-G. Roller-Burnishing With Hegenscheidt Equipment. *Machinery,* v. 91, June 21, 1957, p. 1385-1389.

Roll burnishing technique for cold rolling surface of previously machined components; the rolling operation and machine. (G23s, 1-2)

364-G. Developments in Methods for Processing Titanium. *Machinery (London),* v. 91, Aug. 9, 1957, p. 291, 341. (CMA)

A cheap method of heating the blocks used in stretch-forming is based on separate heating units which may be attached to various blocks. Higher temperatures and uniform heating are needed in drop hammer forming, but the electrical resistance of titanium is helpful. Hollow inlet guide vanes for gas turbines are produced by wrapping titanium around a forming tongue, and aerofoil forms on compressor blades are produced in finished form by a roll-forming process. (G general; Ti)

365-G. Skin Milling at 100 In. per Min. Harold Young. *Machinery,* v. 64, Sept. 1957, p. 167-169.

Gantry-type skin mill at Avro Aircraft speeds output of integrally stiffened skins and completely machined structural members. Skins are machined from solid billets of 75S-T6 aluminum alloy. (G17b, 1-2; Al)

366-G. The Machinability Concept. K. G. Lewis. *Metal Treatment and Drop Forging,* v. 24, July 1957, p. 263-271.

Discusses ambiguity of the term "machinability"; surveys elements of variables used in evaluating machinability and considers individual empirical methods for machining evaluation covering tool force, power consumption and other variables. 42 ref. (G17k)

367-G. Metalworking by Spark-Erosion. Pt. 2. W. Ullman. *Metalworking Production,* v. 101, June 28, 1957, p. 1117-1121.

Advantages and numerous examples of spark-erosion machining for production of dies of tungsten carbide, stellite, stainless steel and alloy steels. (G24a, W24n, 17-7; SS, AY, SGA-m, 6-19)

368-G. Tough Approach to Stainless. A. Quinlan. *Metalworking Production,* v. 101, July 19, 1957, p. 1243-1244.

Speeds of 500 to 1000 surface ft. per min. used for more efficient turning of Types 410 and 321 stainless steels. (G17a; SS)

369-G. How to Machine Cast Iron. Pt. 2. General Machining Recommendations. Norman Zlatin, W. H. Friedlander and Charles F. Walton. *Metalworking Production,* v. 101, July 19, 1957, p. 1245-1249.

Recommends speed, feed, tool material, tool angles, lubricants for turning, milling, drilling, tapping and reaming operations on gray iron. (G17; GI-n)

370-G. Progress Report on Ceramics. Pt. 8. How Should You Use Ceramics. Robert T. Hook. *Metalworking Production,* v. 101, July 26, 1957, p. 1294-1296.

Summary of experiences in machining SAE 4150 hot rolled annealed steel, C-1045 hot rolled annealed steel and AISI C-1015 cold rolled steel with ceramic tools. (G17; CN, SGA-m, 6-20)

371-G. Control of Quality in Automation. Pt. 2. John Loxham. *Metalworking Production,* v. 101, Aug. 2, 1957, p. 1319-1325.

Recently developed automatic controlling equipment for control of grinding operations; gaging and controlling arrangements for centerless, internal, cylindrical and other grinding methods. (G18, 18-24)

372-G. Compression Forming Sets Precise Shapes. *Metalworking Production,* v. 101, Aug. 9, 1957, p. 1384-1385.

Compression forming of high-strength aluminum alloys in a die following forming in a conventional rubber forming press, holds flange angle and mold line to close tolerances. (G14a; Al)

373-G. Progress Report on Ceramics. Pt. 9. Ceramic Tools Pay on Short Runs, Too. George H. De Groat. *Metalworking Production,* v. 101, Aug. 9, 1957, p. 1386-1387.

Experience at North American Aviation indicates ceramic tools may be used with advantage in production turning of SAE 4130 and SAE 4140 because of increased tool life compared to carbide tools. (G17a; AY, SGA-m, 6-20)

374-G. How to Deep Draw Titanium Alloys. E. A. Farrell. *Modern Metals,* v. 13, Aug. 1957, p. 60, 62, 64, 66. (CMA)

Advantages of stamping over other fabrication methods for titanium are speed, low cost, close tolerance and strength. Alloys studied were C-110M, A-110AT, Ti-6Al-4V and RS-110-BX. They have good properties for industrial stamping. (G4b; Ti)

375-G. Planisher Shaves Weld Costs. *Steel,* v. 141, Aug. 19, 1957, p. 150-151.

Roll planishing of welds in aluminum, titanium, stainless or alloy steel sheets improved physical properties of joint. (G23s; Al, Ti, SS, AY, 7-1)

376-G. (French.) **Machining of Copper and Copper Alloys. Pt. 5. Piercing, Milling, Drilling, Threading and Tapping.** *Cuivre Laitons Alliages,* v. 32, July-Aug. 1957, p. 7-17.

Factors involved in drilling; threading tools; tapping speeds. Types of alloys are specified in each case. (To be continued.) (G17; Cu)

377-G. (French.) **Spark Machining and Tooling Problems.** M. Monfils. *Machine Moderne,* v. 51, July 1957, p. 13-16.

Spark machining enabled shop specializing in wire and tube drawing of nonferrous alloys to do difficult machining and retouching jobs on carbide dies and tooling made of alloy steels, stellite type and other cobalt or chromium-base alloys—work previously done by suppliers. Results were savings in money, time and labor, increased production flexibility, reduction in tooling stock carried. Polishing of carbide dies was eliminated. (G24a; SGA-j)

378-G. (French.) **Spark Machining of Items Used in Experimental Work and Research.** M. Grauleau. *Machine Moderne,* v. 51, July 1, 1957, p. 17-18.

Spark machining has resulted in greater precision, better finish, fewer rejects, time savings, in turning out parts made of nickel, copper and other soft metals. (G24a; Ni, Cu)

379-G. (French.) **Mechanics of Metal Cutting.** Roger Jouty. *Ministere de l'Air, Publications Scientifiques et Techniques,* Paris, no. 326, 1957, 98 p.

Shear deformation and friction phenomena; review of theories of Piispanen and Merchant; measuring techniques used in this study, and experimental results; interpretation of results obtained on steel; quantity

of heat released during cutting; rise in temperature of tool and chip; use of carbide tools and experimental results; tool vibration. 43 ref. (G17)

380-G. (German and French.) **Flame Cutting Equipment.** H. P. Siegenthaler. *Zeitschrift für Schweisstechnik,* v. 47, Aug. 1957, p. 201-206.

Types of equipment and operating procedures. (G22g, 1-2)

381-G. **Cutting Analysis Cuts Costs.** William W. Gilbert. *Canadian Metalworking,* v. 20, Aug. 1957, p. 32-36.

Important variables in metal cutting analyzed in computer to achieve full utilization of machine tools in cutting stainless steel and other materials. (G17, S12; SS)

382-G. **Titanium Grinding.** L. C. Hays. *Grinding and Finishing,* v. 3, Sept. 1957, p. 39-44. (CMA)

The main reason for poor results from grinding titanium as steel is ground is the affinity of titanium for other elements. Typical jobs in grinding titanium aircraft parts are considered: belt polishing of jet blades with a sprayer to apply grinding fluid, internal grinding of holes in RC 130B alone or with stainless steel, and form grinding. (G18; SS)

383-G. **How to Make Oxygen Cutting Do More Jobs.** Carl Underwood. *Iron Age,* v. 180, Aug. 29, 1957, p. 63-66.

Suggestions and advantages in using oxy-acetylene for cutting steel; effect of preheating, alloy content, carbon content, jet design, oxygen flow and travel speed. (G22g; ST)

384-G. **Learning Metalwork With Aluminium—Pt. 26.** John C. Older. *Light Metals,* v. 20, Aug. 1957, p. 270-271.

Elementary instructions for spinning aluminum articles. (G13; Al)

385-G. **Progress Report on Ceramics. Pt. 10. Production Turning With Ceramics.** J. Kosinski, C. Hiera and E. Jablonski. *Metalworking Production,* v. 101, Aug. 16, 1957, p. 1413-1416.

Data on machine operation and results obtained using ceramic tools for turning steel bearing sleeves. (G17a; SGA-j, 6-20)

386-G. **How to Abrasive Finish Cast Iron.** Charles F. Walton. *Metalworking Production,* v. 101, Aug. 16, 1957, p. 1421-1423.

Recommended grit size and range for finishing gray iron castings by surface, disc, cylindrical, centerless and internal grinding. (G18; CI)

387-G. **Belt Grinder Finishes Tapered Skins.** Joseph R. Burns. *Metalwoking Production,* v. 101, Aug. 16, 1957, p. 1430-1432.

Abrasive belt grinding machine grinds large flat and tapered surfaces on aluminum, magnesium and stainless steel sheets. (G18; Al, Mg, SS, 4-3)

388-G. **Progress Report on Ceramics. Pt. 11. Ceramic Tools Last Longer on Camshafts.** George H. De Groat. *Metalworking Production,* v. 101, Aug. 23, 1957, p. 1461-1464.

Carboloy 0-30 cemented-oxide tools used for finish-turning of high-alloy cast iron camshafts; tool geometry and a comparison of results with those obtained using carbide tools. (G17a, SGA-j, 6-20)

389-G. **Die Casting Aluminum and Zinc. Pt. 3.** *Modern Metals,* v. 13, Aug. 1957, p. 48-54.

Trimming, blanking, drilling, tapping, deburring, and burnishing operations on zinc and aluminum die castings. Plating and electroplating baths for zinc and aluminum castings. (G general, L10, L17; Al, Zn, 5-11)

390-G. **Deburring Titanium.** *Steel,* v. 141, Sept. 9, 1957, p. 121. (CMA)

North American has developed a device for deburring titanium strip. The strips are pulled through a series of cutting tools and radiused to produce a smooth rounded edge. Breakage in stretch forming has been reduced to 1%, and costs are otherwise reduced. (G19; Ti)

391-G. **Spinning Keeps Pace With New Technology.** *Steel,* v. 141, Sept. 2, 1957, p. 131-134.

Spinning methods; new development in automatic spinning and examples of aluminum, mild, alloy and stainless steel parts produced by spinning. (G13; Al, CN, AY, SS)

392-G. **Cold Heading Copper for Economy.** Theodore B. Smith. *Steel,* v. 141, Sept. 23, 1957, p. 133-137.

Advantages of this process include economy, elimination of scrap, increase in fatigue and shock resistance, improved surface finish and close dimensional tolerance. (G10, 1-17; Cu)

393-G. **Mechanization Cuts Slab Grinding Cost.** H. R. Kerber. *Steel,* v. 141, Sept. 2, 1957, p. 138-144.

Recommends speeds and grinding procedure for grinding chromium and chromium-nickel steel slabs to remove oxidized surface and defects with mechanical grinders. Wheels and grinding practice to insure satisfactory wheel life. (G18; SS)

394-G. The Fundamentals and Application of Form and Thread Rolling. A Cold Forging Technique. Pt. 1. Clifford T. Appleton. *Steel Processing and Conversion,* v. 43, Aug. 1957, p. 440-446.

Reviews thread rolling process; advantages of process include increased length, accuracy, uniformity, material savings, high production speed; thread rolling die and equipment; preferred forms for rolling. (To be continued.) (G12)

395-G. Electrolytic Grinding Tames Hard Metals. Lynn A. Williams. *Tool Engineer,* v. 39, Aug. 1957, p. 96-97.

Desirability of maximum area of contact in electrolytic grinding of tungsten carbide, high speed steel or special alloys.
(G24d, W, C, 6-19, TS-m)

396-G. Honing Speeds. *Tool Engineer,* v. 39, Aug. 1957, p. 117-122.

Recommends honing speed for hard and soft steel; cast iron, aluminum and bronze; data on relation between rotation speed, reciprocating speed, cross-hatch angle and helical speed.
(G19n; ST, Ci, Al, Cu-s)

397-G. This Thing Called Machinability. Pt. 1. W. A. Nordhoff. *Western Machinery and Steel World,* v. 48, Aug. 1957, p. 73-76.

Data on machinability as affected by quality and nature of cutting tools, depth of cut, feed rate, spindle speed and microstructure of materials such as mild and medium carbon steels, nickel steels, stainless, cast iron, malleable iron, nickel alloys, chromium, titanium, copper, aluminum or magnesium. (To be continued.) (G17k)

398-G. (Italian.) **Oxygen Cutting Equipment.** Oscar Grossi. *Macchine,* v. 12, Aug. 1957, p. 729-745.

Detailed review of all types of flame cutting equipment; accessories, applications, performance, gas consumption of each type.
(G22g, 1-2)

399-G. (Italian.) **Classification of Cutting Fluids by Means of Laboratory Tests.** F. di Mento, A. Palumbo and A. Testore. *Rivista di Meccanica,* no. 162, May 25, 1957, p. 19-27.

Cutting fluids defined as those used in operations in which chip is formed by action of a tool. Causes of heat generation in tool-part relationship; functions, characteristics, greasiness of cutting fluids; emulsifiable oils; typical machining operations and choice of fluids; testing on machine tools. (To be continued.) (G17; NM-h)

400-G. Test Results on Forming Titanium Extrusion. I. J. Wilson. *American Machinist,* v. 101, Sept. 23, 1957, p. 121-123. (CMA)

Extrusions of Ti-6Al-4V and A-110AT were subjected to stretch-wrapping, double offset bending and bending to a specific angle to make comparisons with titanium sheet. Die marks on the extrusions greatly affect bending perpendicular to the marks. Oxide scale contributes to cracking unless removed.
(G6, G9; Ti, 4-8)

401-G. Special Techniques for Increasing Strength and Fatigue Life of Steel Stressed in Torsion. N. E. Hendrickson. *ASTM Bulletin,* no. 224, Sept. 1957, p. 40-43.

Shot peening and presetting make it possible for 40 lb. of steel in torsion bar springs, for track-type vehicles, to do a job which would otherwise require almost twice as much material. 4 ref.
(G23n, G23q; ST)

402-G. Sub-Zero Machining and Quenching. R. J. Delaney. *Machinery,* v. 91, Sept. 6, 1957, p. 548-551.

Results obtained in milling and machining chromium-molybdenum steel, stainless steel and titanium using subzero coolants and subzero quenching have shown reduced tool wear and increased dimensional stability. (G17, 1-17; AY, SS, Mo)

403-G. Experimental Investigation Into the Characteristics and Behavior of the Built-Up Nose When Machining Mild Steel With High Speed Steel Tools. W. B. Heginbotham. *Microtecnic,* v. 11, no. 3, 1957, p. 113-121.

Factors controlling transition from simple shear condition to the built-up nose condition, with conclusion that it is not possible to operate high-speed steel tools on mild steel without a built-up nose being created, since mechanical failure of tool occurs at rake angles greater than 45°. 5 ref. (G17; CN, TS-m)

404-G. (French.) **Machining of Metals by Electric Erosion.** W. Ullman. *Machine Moderne,* v. 51, Sept. 1957, p. 37-48.

The importance of electro-erosion in machining is increasing at the expense of classical processes. The electro-erosion processes can be classified as electro-sparking or electro arcing. In either of these processes, it is an electrical force, instead of a mechanical force, which removes the metal. The process is cheap and convenient. (G24a)

405-G. New Angle in High-Speed Turning. *American Machinist,* v. 101, Oct. 7, 1957, p. 122-123. (CMA)

Application of a new tool geometry in high-speed turning of Ti-150A. Speeds of 1600 sfpm. are attained when the cutting tool is held at 50° to the axis of the workpiece; tool life is 1 hr. The holding device is designated the "Cross Chord" tool and all the angles are incorporated. The clamp acts as a chip guide. The flatness of chip shear plans permits high feed rates. (G17a; Ti)

406-G. Bringing Science to Art. Floyd G. Lawrence. *Automatic Machining,* v. 18, Sept. 1957, p. 40-41.

Notes ASTE program for research in metal cutting and machinability. Literature compilation nears completion. (G17, A9, 11-15)

407-G. Stainless Steel. Pt. 5. J. A. Ferree. *Automatic Machining,* v. 18, Sept. 1957, p. 60-64.

Speeds, feeds, tool types and other suggestions for turning, cutting off, forming, boring stainless steels. (G17; SS)

408-G. New Techniques in Sheet Metal Forming. John A. Grainger. *Institution of Production Engineers, Journal,* v. 36, Sept. 1957, p. 593-606.

Less orthodox methods of presswork, which are considered as being high-production methods of the future, if and when machines and equipment are developed to such state of perfection and cheapness as to be an economic investment. Covers triple-action presses, "Marforming", "Hydraw" and "Hydroform" processes, "dyzacking" and flow-turning. (G9, G14; 4-3)

409-G. Milling Titanium Alloys: Experience Modifies Thinking. A. L. Winkler. *Iron Age,* v. 180, Oct. 10, 1957, p. 126-128. See also: **Tips on Titanium Milling.** A. L. Winkler. *Steel,* v. 141, Oct. 7, 1957, p. 176, 178, 181. (CMA)

Facing, milling and slotting tests were run on AMS 4925 titanium forgings. Recommendations are given. (G17b; Ti, 4-1)

410-G. New Theory Bolsters Grinding Research. P. M. Unterweiser. *Iron Age,* v. 180, Sept. 12, 1957, p. 127-129.

Note on approach to accurate measurement of temperatures in the analysis of heat generated during grinding operation. (G18, S16)

411-G. On the Multiple Hole Extrusion of Sheets of Equal Thickness. L. C. Dodeja and W. Johnson. *Journal of the Mechanics and Physics of Solids,* v. 5, no. 4, 1957, p. 267-280.

Slip-line fields are proposed and pressures calculated for extrusion of sheet through square die containing one, two or three orifices, when container walls are perfectly smooth or rough. Experimental determinations of parameter p/2k for pure lead, tellurium lead and pure tin are compared with those predicted. Actual rate of flow of material through each orifice of three-hole die is compared with predicted rate. 7 ref. (G5; Pb, *Te,* Sn)

412-G. The Cold Extrusion of Circular Rods Through Square Multiple-Hole Dies. L. C. Dodeja and W. Johnson. *Journal of the Mechanics and Physics of Solids,* v. 5, no. 4, 1957, p. 281-295.

Experiments were carried out to determine pressure necessary to cold extrude pure lead, tellurium-lead, pure tin and super-pure aluminum through 90° dies containing up to four holes arranged in different patterns. Formula was deduced for calculation of required pressure; summary of observations on nature of flow of metal during its passage through die holes is given; experimental results affording comparison between plane-strain and axisymmetric pressures and flow patterns are described. 11 ref. (G5; Pb, *Te,* Sn, Al)

413-G. North American Research on Machining Titanium Alloys. Kenneth Loo. *Machinery,* v. 64, Oct. 1957, p. 157-161. (CMA)

Titanium alloy plates are friction-sawed effectively dry with dull blades at speeds of 10,000 sfpm. Carefully annealed alloys show little warpage. Sharp tools prevent burring and work hardening. Throw-away insert-type carbide cutters are preferred for turning operations.

Research does not support the view that the segmented chip is a characteristic of titanium. Such chips are caused by ultrasonic vibration. Segmentation is influenced more by tool rigidity than feed or speed. (G17; Ti)

414-G. Hot Forming Operations on Titanium. E. A. Wooden and T. P. Iodice. *Machinery (London),* v. 91, Sept. 13, 1957, p. 637-645. (CMA)

Hot forming operations on titanium for intricate contours and small-radius bends without fractures or distortion. Heating is controlled to a temperature which is dependent on the part formed and the forming method. In stretch forming the form blocks of different design have built-in heating units; 300-400° F. temperatures have been adequate. (G1, 1-16; Ti)

415-G. The Machinability Concept. K. G. Lewis. *Metal Treatment and Drop Forging,* v. 24, Sept. 1957, p. 351-357.

Various formulas are developed to assess machining performance by tensile properties and to provide an index of machinability. 27 ref. (G17k)

416-G. Experiments on the Cold Forming of Titanium as Carried Out by Briggs Motor Bodies, Ltd. P. G. Patten. *Sheet Metal Industries,* v. 34, Oct. 1957, p. 741-744.

Use of a chemical immersion coating during the press forming of titanium. Treatment involves simple immersion with a short-time cycle giving a dark gray fine crystalline coating from an inorganic solution. (G1, 1-17; Ti)

417-G. Forming Titanium Sheet. *Tool Engineer,* v. 39, Oct. 1957, p. 123. (CMA)

Hot forming is necessary for titanium, but the method may be conventional otherwise. Graphite is the lubricant used in the 1000-1350° C. drawing range. In this range the shapes can be more intricate and the draws deeper, while hydrogen embrittlement is minimized. Springback is no problem and intermediate anneals are unnecessary. (G1, 1-16; Ti, 4-3)

418-G. How to Design Practical Tooling for Cold Extrusion. John Verson. *American Machinist,* v. 101, Oct. 7, 1957, p. 129-144.

Principles of cold impact extrusion of steel; metal flow and other factors in the design of punches and forward and backward extrusion dies. (G5, 1-2, 17-1)

419-G. Use of Coated Steels in Drawing. *Industrial Finishing,* v. 9, Sept. 1957, p. 811-812.

Electroplated zinc coating or phosphate coatings on iron and steel increased drawability as indicated by wedge draw test. (G4, 17-2; ST, NM-h)

420-G. Choose Your Press Drawing Lubricants With Care. Leon Salz. *Lubrication Engineering,* v. 13, Sept. 1957, p. 494-500.

Functions of drawing lubricants; relative drawability of stainless, high-carbon, low-carbon steels, brass and aluminum; influence of condition of metal on drawability; die efficiency; drawing lubricant components; classification of press drawing lubricants; metallic coatings as an aid to lubrication process. (G4, 17-2; SS, ST, Cu, Al, NM-h)

421-G. Cutting Fluids: Fundamentals and Laboratory Evaluation. L. H. Sudholz. *Lubrication Engineering,* v. 13, Sept. 1957, p. 509-515.

Tool life, surface finish, tool wear, power requirements as fundamentals of cutting process; nature of problem of lubrication, effect of cutting fluids; means of laboratory evaluation. For accurate evaluation, actual metal cutting operations under carefully controlled conditions, as opposed to analytical and even bench tests, are required. New test techniques, such as radioactive tracer method for evaluating life of cutting tool, are rapid, and results correlate with field experiences. (G17, 17-2, 1-4; NM-h)

422-G. Evaluating Cutting Fluids in Accelerated Machining Tests. F. J. Dasch, P. L. Eisler, W. D. McHenry and R. K. Paton. *Lubrication Engineering,* v. 13, Sept. 13, 1957, p. 516-520.

Studies conducted with radioactive tools to establish relative performance of three emulsifiable and three compounded mineral oils. Significant difference was found in rate of tool wear between two types of oils; no significant difference was noted between oils within either group. Parallel study of tangential and feed forces proved insensitive for conditions of these tests. (G17; NM-h)

423-G. Some Recent Applications of Chemical Machining. C. L. Hibert. *Machinery,* v. 91, Sept. 20, 1957, p. 682-686.

Capabilities and specific applications of chemical milling to production of aircraft components from aluminum, magnesium and titanium alloys and stainless steels. (G24b; Al, Mg, Ti, SS)

424-G. Experiences and Problems in the Surface Treatment of Die-Castings. Pt. 1. Mechanical Processes. W. Ruegg. *Metal Industry,* v. 91, Oct. 18, 1957, p. 333-335.

Working methods employed by Injecta Ltd. (Switzerland) for the surface treatment of zinc and aluminum pressure die castings. Grinding, polishing, sand blasting and barrel polishing. (To be continued.) 4 ref. (G18, L10, L12; Zn, Al, 5-11)

425-G. Electrical Discharge Cuts Difficult Slits. E. J. Lach and C. Munter. *Metalworking Production,* v. 101, Sept. 20, 1957, p. 1709-1711.

Electrical discharge machine cuts slit in uranium and Monel rings used in high-speed rotors for neutron research. (G24a; U, Ni)

426-G. Temco Overcomes Titanium Bottlenecks. D. L. Beasley. *Modern Industrial Press,* v. 19, Oct. 1957, p. 34-35. (CMA)

Aircraft parts are made from 0.016 to 0.100-gage sheet and are either formed hot at 1000° F. or formed cold and stress relieved at 1000° F. for 30 min. The oxide coating formed during heating is removed by a patented descaling process. (G1, L12; Ti)

427-G. Dewalt's New System Takes the Guesswork Out of Sawing Aluminum. Oscar H. Nus. *Modern Metals,* v. 13, Sept. 1957, p. 46-56.

Blade size, speed, horsepower requirements and cutting position determination for high-speed sawing of aluminum alloys. (G17h; Al)

428-G. Magnesium Alloy Sheet. F. L. Coenen. *Modern Metals,* v. 13, Sept. 1957, p. 88-90.

Considerations in shearing and blanking, brake forming, roll forming, stretch forming, rubber pad forming, drop hammer forming and deep drawing of FS—1 magnesium alloy. (G general; Mg, 4-3)

429-G. Experiments on the Cold Forming of Titanium. P. G. Patten. *Sheet Metal Industries,* v. 34, Oct. 1957, p. 741-744. (CMA)

Pretreatment by degreasing and pickling. Drawing of cups; annealing, sodium hydride descaling and reprocess coating. (G4; Ti)

430-G. Choose the Right Lubricant. Pt. 1. Leon Salz. *Steel,* v. 141, Oct. 14, 1957, p. 132-135.

Water dispersible and oil-type lubricants and factors governing their selection for stamping or drawing operations on carbon alloy or stainless steels, aluminum and copper-base alloys. (G3, G4; CN, SS, Al, Cu, NM-h)

431-G. This Thing Called Machinability. Pt. 2. W. A. Nordhoff. *Western Machinery and Steel World,* v. 48, Sept. 1957, p. 98-101.

Tabulated data on power requirements and horsepower values for units of stock removed per minute for turning, drilling or milling a wide variety of metals and application of this information to obtain optimum production. (G17)

432-G. (German.) **Argon-Arc Cutting of Nonferrous Metals.** E. Witting. *Schweissen und Schneiden,* v. 9, Sept. 1957, p. 391-394.

The gas shielded cutting process; characteristics of nonferrous metals; cost factors. 5 ref. (G22h; EG-a38)

433-G. (Italian.) **Liquid Coolants for Metalworking.** Domenico Viotti and Angelo Albertocchi. *Ingegneria Meccanica,* v. 6, July 1957, p. 17-22.

Practical problems involved in storing, handling and use of cutting fluids; factors to be used as guides in selection of best fluid for each operation; functions and properties of various types of coolants. (G general, NM-h)

434-G. (Italian.) **Stamping of Metals by Hot Plastic Deformation. Pt. 7. Sawing.** Romeo Giusfredi. *Rivista di Meccanica,* v. 8, Aug. 3, 1957, p. 13-15.

Types of sawing machines, operational details. (To be continued.) (G17h, 1-2)

435-G. (Norwegian.) **Chip-Forming Machining of Titanium.** *Teknisk Ukeblad,* v. 104, Sept. 19, 1957, p. 761-765. (CMA)

Ranges of speed and feed and recommended tool geometries for turning, boring, broaching, milling and other operations. American literature sources quoted. 19 ref. (G17; Ti)

436-G. (Russian.) **New Wheel Producing Department of Nizhnii Tagilskii Metallurgical Combine.** S. V. Makaev, G. V. Kotelnikov, M. I. Staroseletskii and L. A. Narutskaya. *Stal',* v. 17, July 1957, p. 616-621.

Description of a new wheel producing department; cutting, stamp-

ing and heat treatment operations. (G3, J general; ST)

437-G. (German.) **Economy in Free-Cutting Machining.** Milton C. Shaw. *Industrie-Anzeiger,* v. 79, July 12, 1957, p. 847-851.

Determination of optimal relationship between cutting speed and feed to achieve low cost. 7 ref. (G17, 17-3)

438-G. (German.) **Self-Stimulated Vibrations During Manipulations of Metals.** Milton C. Shaw and W. Hölken. *Industrie-Anzeiger,* v. 79, Aug. 6, 1957, p. 959-964.

There are two types of self-stimulated vibrations during machining; the first occurs when the system tool-workpiece oscillates in vicinity of free tool. Tool movement in this oscillation is primarily in direction of principal section force. The second occurs when frequency of the system tool-workpiece lies in vicinity of natural frequency of free tool. The main cause of this oscillation is change of shearing angle created by periodical change of free surface inclination during the operation. 6 ref. (G17, Q10)

439-G. (Italian.) **Machining Nimonic Alloys.** *Nickel,* no. 69, Aug. 1957, p. 1-7.

General rules for machining as influenced by character of the metal. Specific recommendations as to techniques, tooling and lubrication for milling, broaching, turning, grinding, reaming, sawing and tapping operations. Tables of composition, physical properties, test performance. (G17; Ni)

440-G. (Pamphlet.) **Machining and Grinding of Gray and Nodular (Ductile) Cast Irons.** Norman Zlatin and Charles F. Walton. 57 p. 1957. Gray Iron Founders' Society, Inc., 930 National City—E. 6th Bldg., Cleveland, Ohio. $3.

For use in the design, engineering and production of cast components; commercial and practical examples. (G17, G18, CI-n, CI-r)

SECTION H

POWDER METALLURGY

1-H. Powder Metallurgy. IV. J. F. C. Morden. *Metal Industry,* v. 89, Nov. 16, 1956, p. 409-411.

Mixing, forming, powder characteristics and production considerations. (To be continued.) (H general)

2-H. Metal Powder Parts Get New Look. *Steel,* v. 139, Dec. 3, 1956, p. 121-124.

They're becoming larger, more intricate in cross section. New presses can make production quantities of shapes that once would have required costly tooling. (H14, 8-22)

3-H. Porous Powder Metallurgical Products for Filtration and Related Uses. E. Bishop and G. M. Collins. Paper from "Chemical Engineering Practice". v. II. Academic Press. p. 464-482 + 4 plates.

Manufacture and applications of porous metal articles. (H general, T29, 8-21)

4-H. Powder Metallurgy. Ivor Jenkins. Paper from "Chemical Engineering Practice". v. II. Academic Press. p. 483-532.

Manufacture, properties and testing of metal powders; principles of compacting and sintering; general engineering components; future trends. (H general)

5-H. Metal Powder Parts Get New Look. *Steel,* v. 139, Dec. 3, 1956, p. 121-124.

Intricate and larger parts made possible by multiple motion presses increase use of metal powder products. (H14)

6-H. Powder Metallurgy of Zirconium. H. S. Kalish. Paper from "Zirconium — Technology and Economics". Atomic Industrial Forum, p. 29-33. (CMA)

Zirconium powder prepared by decomposition of ZrH is irregular and somewhat sintered together, that from leaching zirconium produced by magnesium reduction is spheroidal and uniform, and that from calcium reduction of ZrO_2 is lacy and aggolmerated. Leached sponge is more free from oxygen and nitrogen than the others. Basic methods of fabricating zirconium powders are enumerated and described. Cermets are produced from zirconium powders. A Zr-U system of alloys made by powder metallurgy has been studied. (H general; Zr)

7-H. Infiltration of Cermets for Improved Toughness. Claus G. Goetzel and John B. Adamec. *Metal Progress,* v. 70, p. 101-106.

Composite structures produced by impregnating porous titanium carbide compacts with a metallic binder have better impact strength and oxidation resistance than conventional cermets. (H16e, 6-20)

8-H. Rate of Capillary Rise of Liquid Metal in a Higher Melting Metal Powder Compact. K. A. Semlak, C. W. Spencer and F. N. Rhines. *Journal of Metals,* v. 9, Jan. 1957, p. 63, 64.

Investigation of capillary rise of liquid copper, saturated with iron, in a column composed of partially sintered iron powder. 2 ref. (H general, P13; Cu, Fe)

9-H. Properties of Aluminum Powders and of Extrusions Produced From Them. F. V. Lenel, A. B. Backensto, Jr. and M. V. Rose. *Journal of Metals,* v. 9, Jan. 1957, p. 124-130.

Tensile strength and yield strength of extrusions are functions of powder particle size or flake powder thickness. Oxide content, except as it depends on flake thickness has only a minor effect; degree of dispersion of the oxide appears to be the controlling factor in the strengthening

mechanism of extrusions. 17 ref. (H11, Q23c, Q27a; Al, 4-8)

10-H. A Guide to Using S.A.P. R. Irmann. *Precision Metal Molding,* v. 15, Jan. 1957, p. 58-63; disc., p. 120.

Sintered aluminum powder, properties, processing techniques and applications. (H general; Al)

11-H. Investigation of Possible Methods for Consolidating Zirconium Sponge for Use as Consumable Electrodes. H. R. Hoge. *U. S. Atomic Energy Commission. WAPD-RM*-152, Nov. 7, 1952, 8 p. (CMA)

Methods for consolidating zirconium sponge into forms suitable as electrodes were studied and included hot compacting, cold compacting, sintering of compacts by induction and by resistance heating, and extrusion. Each method has its advantages and disadvantages. Prior compacting seems desirable in all cases. Cold compacting to over 70% density produces acceptable electrodes. Induction sintered and extruded electrodes show much promise. (H14, H15, W18; Zr)

12-H. (German.) **Short Description of Powder Techniques in Connection With Properties and Behavior of Iron Oxide Aerosols.** R. Meldau. *Archiv fur das Eisenhüttenwesen,* v. 27, Nov. 1956, p. 673-679.

Description of separation of iron oxide from "brown smoke". Dependance of separation upon temperature and amount of steam added. Use of iron oxide pigment in dyes, paints and sintered metals. 26 ref. (H10, T29; Fe)

13-H. Basic Research on Sintered Titanium Powder Analogous to "SAP" for High-Temperature Strength. Summary Report. E. P. Weber. *Clevite Corp. Summary Report under contract NOas 55-505-C,* June 1956, 44 p. (PB 121559) Abstracted in: *U. S. Government Research Reports,* v. 27, Feb. 15, 1957, p. 59. (CMA)

TiH_2 of 5-10 μ particle size can be made, compacted, dehydrogenated, sintered and extruded to rod possessing good strength, ductility and tensile properties. Silicon can be coated on the particles by vapor phase reduction of $SiCl_4$ with hydrogen. Sintering and dehydrogenating below 800° C. does not rupture the silicon film. ThO_2 is stable as a disperse phase up to 1200° C. and hardens effectively if the dispersion is fine enough. (H general, Q27a, 2-12; Ti)

14-H. Manufacture of Reduced Iron Power for Micro-Wave Attenuators. Astuo Nishioka. *The Electrical Communication Laboratory, Nippon Telegraph and Telephone Public Corp, Reports,* v. 4, Aug. 1956, p. 16-19.

Chemical reduction method for the production of iron powder. (H10c; Fe)

15-H. Particle Size Distributions of Iron Powders. Astuo Nishioka. *The Electrical Communication Laboratory. Nippon Telegraph and Telephone Public Corp. Reports,* v. 4, Aug. 1956, p. 33-36.

Measurement of particle size distribution of reduced iron powder by sieve and wind selection methods. (H11g, H11h; Fe)

16-H. Powder Metallurgy—VI. J. F. C. Morden. *Metal Industry,* v. 90, Jan. 1957, p. 23-25.

Compacting by hot pressing, rolling and extrusion. 8 ref. (H14)

17-H. Development of Titanium Alloy Powder Production. G. F. Davies. *U. S. Watertown Arsenal Laboratory, Report 401/120-23,* Aug. 1953, 42 p. (PB 111918). Abstracted in *U. S. Government Research Reports,* v. 27, Feb. 15, 1957, p. 60. (CMA)

Preparation methods for titanium alloy powders are described and titanium powder scraps are evaluated. Scrap alloy may be used to produce powder by an attritioning method, by mechanical mutilation and the mercury technique, and by mechanically cutting massive scrap under mercury. (H10e; Ti)

18-H. (French.) **Quality Control of Powder Metal Items.** *La Machine Moderne,* Jan. 1957, p. 14-61.

Various quality control tests currently employed at the Yale and Towne Manufacturing Co. in the manufacture of powder metal items. Equipment used to test each stage of the manufacturing process. (H general, 1-4, 1-2)

19-H. (German.) **Phenomena Ocurring During Sintering of Metallic Materials.** R. Palme. *Metall,* v. 11, Jan. 1957, p. 8-9.

Basic processes are described for sintering one-phase metal powders with special emphasis on the influence of sintering temperature. Practical applications. Metal powder loss during sintering process is explained. 7 ref. (H15n, 2-11)

20-H. Producing Powdered Metal Components. Techniques of Importance to the Electrical Industry. K.

Roney. *Electrical Times,* v. 131, Jan. 10, 1957, p. 41-44.

Manufacture and applications of metal powders; two of the most important processes in manufacture are considered to be annealing and sintering. (H general, T1)

21-H. Powder Metallurgy Provides a Short Cut to Titanium Parts. E. P. Weber. *Modern Metals,* v. 13, Feb. 1957, p. 48-49, 50, 52. (CMA)

Four important methods of making titanium powder described. The electrolytic approach is not yet commercial, while the hydriding method yields the finest powder; mechanical powdering is feasible only for coarse powder. Working the powder may be accomplished by hot pressing, best for large parts, or press forming, which may be combined with extrusion, rolling, swaging and drawing. Specimens have good tensile and fatigue properties. (H10, H14; Ti)

22-H. Design Limits Set by Tooling for Powder Metal Parts. George G. Karian. *Electrical Manufacturing,* Feb. 1957, p. 110-115.

Principles of powder metal design. Five classes of parts and tools discussed from design point of view. (H general, 17-1)

23-H. Powder Metallurgy. J. F. C. Morden. *Metal Industry,* v. 90, Feb. 8, 1957, p. 103-105, 108.

Furnaces, gas atmospheres for sintering. (H15q, W26)

24-H. Dispersed Hard Particle Strengthening of Metals. Nicholas J. Grant and Oliver Preston. *Journal of Metals,* v. 9; *AIME Transactions,* v. 209, Mar. 1957, p. 349-356.

Review of increased strength and stability at high temperatures of metals such as aluminum, molybdenum, copper, nickel and magnesium, upon dispersion of hard finely divided particles of aluminum oxide or other materials; mechanical mixing and sintering; internal oxidation and other methods of achieving hard particle distribution; theoretical aspects of hardening and strengthening mechanism. 37 ref. (H16d, Q27a, Q29n)

25-H. Metallic Filters by Powder Metallurgy. John Haertlein. *Journal of Metals,* v. 9, Mar. 1957, p. 326-330.

Data on sintered bronze filters; their calculated pore size; efficiency compared to paper filters; influence of sintering time and temperature on shrinkage, effect of shrinkage on permeability, strength and pressure drop characteristics; uses of stainless steel and metallic fiber filters. (H general, X21, 17-7; Cu-s, SS)

26-H. High Strength Structural Parts by Powder Metallurgy—Theory. Henry H. Hausner. *Journal of Metals,* v. 9, Mar. 1957, p. 331-333.

Crystal lattice defects, their orientation and relationship to strength in powder metallurgy; effect of compacting temperature and time on physical properties; density-strength relationship. (H11, M26)

27-H. High Strength Structural Parts by Powder Metallurgy—Techniques. George Stern. *Journal of Metals,* v. 9, Mar. 1957, p. 334-335.

Sintering, hot pressing, infiltration and vacuum sintering techniques used for producing high strength parts. (H14h, H15, H16e)

28-H. High Strength Structural Parts by Powder Metallurgy—Applications. J. M. Copeland. *Journal of Metals,* v. 9, Mar. 1957, p. 336-339.

Importance of control of material, die design and fabricating variables in production of high-strength parts. (H general; SGB-a)

29-H. Metal and Self-Bonded Silicon Carbide. R. E. Wilson, et al. U.S. Air Force. Wright Air Development Center. Technical Report 54-38. Jan. 1956. *U.S. Office of Technical Services,* PB 121353, 33 p. (CMA)

A study of the hot pressing of molybdenum-silicon carbide compositions shows that a bond of Mo_4CSi_3 results. This was synthesized and used as the aggregate in a nickel-bonded cermet. Three compositions were evaluated as rocket nozzle materials. (H14h, Si, 6-19)

30-H. Development of Titanium Powder Production. Final Report. A. J. Hatch, E. P. Weber and A. D. Schwope. U.S. Watertown Arsenal Laboratory. Report 401/120-24, Sept. 1955. *U.S. Office of Technical Services,* PB 121766, 44 p. (CMA)

Strengths from powder metallurgical Ti-6 Al-4V have been obtained which are comparable to the arc melted and worked alloy; hot pressing was used. Ball milling in inert atmosphere was used to prepare fine master alloys, which may then be hydrided for fast commutation. (H10, H14h; Ti)

31-H. Preliminary Study of Three Cermets Based on Uranium Oxide. L. S. Williams, D. T. Livey, E. Barns and P. Murray. *Journal of Nuclear Energy,* v. 4, Feb. 1957, p. 164-178.

Fabrication and some properties of the three cermets investigated. Fabrication by hot pressing method is feasible, provided an argon atmosphere is used. The use of silicon as the metallic constituent at 20% by volume improves oxidation resistance of uranium oxide in air at temperatures up to 900° C. 10 ref. (H14h, R1h; U, 6-20)

32-H. Carbides That Are Weldable, Machinable and Heat Treatable. John L. Ellis. *Tool Engineer,* v. 38, Apr. 1957, p. 103-105.

Physical properties and methods of production involving compaction in sintering of titanium carbide followed by infiltration with steel. Cutting tool material can be machined in annealed condition, responds to heat treatment and is weldable and costs less than cemented tungsten carbide. (H15n, H16e; SGA-j, 6-19)

33-H. An Investigation of the Slip-Casting Mechanism as Applied to Stainless Steel Powder. W. G. Lidman and R. V. Rubino. Sylvania Electric Products, Inc. *U.S. Atomic Energy Division,* SEP-208, Feb. 23, 1956, 23 p.

The slip-casting technique, which is successfully employed in the ceramic industry, was utilized to produce sintered stainless steel components experimentally. The procedure used is described, along with an evaluation of the physical and mechanical properties of the samples produced. (H general; SS)

34-H. (Russian.) **Study of the Possibility of Preparing Metal-Ceramic Hard Alloys From Borides of Chromium, Titanium and Tungsten.** I. I. Iskok'dskii and L. P. Bogorodskaya. *Zhurnal Prikladnoi Khimii,* v. 30, Feb. 1957, p. 177-185. (CMA)

It is shown that it is impossible to prepare metal-ceramic alloys from borides of chromium, titanium and tungsten using iron, nickel or cobalt as binders, since these metals react chemically with the above borides. The interstitial metal interacts with the borides during sintering and disappears. These interactions point to the existence of a new kind of ternary boron-metal system. 11 ref.
(H general; Cr, Ti, W, 6-20)

35-H. (Book—Russian.) **Questions on Powder Metallurgy and the Strength of Materials, No. 111.** 1956. 145 p. Institute of Metalloceramics and Special Alloys, Academy of Sciences Ukrainian SSR, Kiev, U.S.S.R.

Includes the following articles: The Elastic Constants of Metals and Alloys, by I. N. Frantsevich; The Phenomenon of Electromigration in Solid Metallic Solutions, by I. N. Frantsevich and D. F. Kalinovich; The Interaction of Titanium Carbide With Nickel, by V. N. Yeremenko, V. M. Polyakova and Z. P. Golubenko; The Interaction of Titanium Carbide With Cobalt, by V. N. Yeremenko and N. D. Lesnik; The Comparative Investigation of the Properties of Iron Powders, by I. M. Fedorchenko, N. A. Filatova and N. N. Sereda; The Conditions for Production of the Properties of Metalloceramic Aluminum, by G. K. L'vov; Geometric Parameters of the Hysteresis Loop as Characteristics of the Damping Properties of Material, by G. S. Pisarenko and V. V. Khil'chevskiy; Heat Resistant Alloys Based on Titanium Carbide, by V. V. Grigor'yeva.
(H general, N general, Q general)

36-H. Crystal Bar Hafnium Powder, Its Production, Mechanical and Corrosion Properties. C. T. Waldo and W. K. Anderson. *U.S. Atomic Energy Commission,* KAPL-M-CTW-2, Jan. 10, 1957, 10 p. (CMA)

Hot rolled hafnium powder gives samples with poorer mechanical properties than those from arc-melted and rolled metal. Preliminary corrosion data indicate a superiority over powder metallurgical zirconium. The hydriding process of powder formation is adaptable to large-scale operations. However, the inferior mechanical properties may stem from hydriding.
(H10c, Q general, R general; Hf)

37-H. Purification of Niobium by Sintering. W. G. O'Driscoll and G. L. Miller. *Institute of Metals, Journal,* v. 85, Apr. 1957, p. 379-384.

Study of columbium's purification by sintering powdered compacts in vacuum. Ductile massive columbium containing 0.05% oxygen, 0.01% nitrogen and carbon and silicon less than 0.01% prepared by high-temperature vacuum sintering on commercial scale. (H15q, 1-23; Cb)

38-H. Production and Fabrication of Massive Niobium Metal. L. R. Williams. *Institute of Metals, Journal,* v. 85, Apr. 1957, p. 385-392.

Account of melting and powder metallurgical methods for producing ductile columbium from powder. Discusses compacting and sintering processes, including methods of heating, power requirements, vacuum requirements, sintering equipment and techniques, chemical and physical changes; experience in cold forming of sheet, tube, rod and wire and in spot welding and inert-gas arc welding methods. (H14, H15, C5, G general, K1d, K3n; Cb)

39-H. Metal and Alloy Powders—a Directory. Herbert B. Michaelson. *Materials and Methods,* v. 45, Apr. 1957, p. 163-169.

Lists production method (or particle shape), approximate mesh size, purity and name of supplier in comprehensive directory of commercial metal powders.
(H10, H11; 6-18)

40-H. Powder Metallurgy. Pt. 8. Factors Affecting Growth and Porosity in Sintering. J. F. C. Morden. *Metal Industry,* v. 90, Apr. 5, 1957, p. 265-268.

Reviews and discusses factors influencing growth, shrinkage and porosity in sintering bronze, brass, copper, tin and iron powder compacts. Factors listed are time, temperature, particle size, shape, plasticity, purity, gas adsorption, compacting pressures, powder stresses, recrystallization, diffusion and furnace atmosphere. (H15; Cu, Sn, Fe)

41-H. Atmospheres for Sintering Furnaces. N. K. Koebel. *Metal Progress,* v. 71, May 1957, p. 91-98.

Powder metal compacts consist of such tiny fragments, have such large surface-to-mass ratio that sintering must be done in highly protective atmospheres. These are generated in the same types of equipment as widely installed in modern heat treating departments.
(H15q, 1-2)

42-H. Preliminary Report on the Manufacture of Gadolinium-Containing Materials by Powder Metallurgy. H. H. Hausner and N. P. Pinto. *U.S. Atomic Energy Commission,* SEP-64, Apr. 26, 1951. 9 p. (CMA)

In a development program for reactor control rods, various compositions containing gadolinium compounds were studied metallographically prior to operational tests. GdC_2 powder was prepared from Gd_2O_3. Both were used to the extent of 10% in compacts with beryllium powder. Hot pressing at 600-650° C. and 25 tons per sq. in. yields a dense product with good corrosion resistance to hot water. Compact with titanium powder is contemplated. (H10, H14h, T11j, 17-7; Gd)

43-H. Extrusion of Composite Compacts of Particles of Heavy Metal in an Aluminum Matrix. Hot Pressing and Extrusion of Zirconium by Electrical Resistance Heating. A. B. Backensto. *U.S. Atomic Energy Commission,* SO-3004, June 30, 1951. 92 p. (CMA)

Electrical resistance sintering was used to make compacts of zirconium powder in an aluminum matrix. Hot working by extrusion also made suitable compacts, sheaths for the compacts being provided by a pure aluminum powder. A pure zirconium powder could be compacted by electrical sintering if atmospheric contamination is avoided. Ductility is good and cold reduction of 40% may be effected. Billets formed by electrical resistance extrusion are described. (H14k, 16-11; Zr)

44-H. Ground Zirconium Metal Powder Pilot Plant. Final Technical Report for Apr. 21-Oct. 20, 1952. A. C. Demos. Foote Mineral Co., under Contracts DA-36-034-ORD-389RD and DA-36-034-ORD-884RD. *U.S. Office of Technical Services,* PB 124145, May 1956. 39 p. (CMA)

A pilot plant with a capacity of 20 lb. of zirconium powder (100 mesh, 10 micron) per 8-hr. day was successfully operated for six days. The process involves the production of a fused sponge through calcium reduction of zirconia tetrachloride, acid leaching, crushing, grinding, drying and packaging. A process flow sheet and experimental data are included. (H10e, C1p; Zr)

45-H. (French.) **Little Known Aspects of the Role Played by Cobalt in the Sintering of Hard Alloys.** René Bernard. *Metallurgie et la Construction Mécanique,* v. 89, Apr. 1957, p. 307-312.

In double carbides with low cobalt content there is an additional phase of which little is so far known. This phase is studied by means of metallographic examination. The influence of decarburization on physical properties is noted, and advice is given to producers and users. 5 ref. (H15, M27d; Co)

46-H. Fundamentals of Sintering. Pt. I. A. Pranatis and L. Seigle. Sylvania Electric Products, Inc. *U.S. Atomic Energy Commission,* SEP-229, Oct. 5, 1956, 20 p.

A study of the mechanism of sintering in pure oxides and metals. In order to ascertain whether the sintering rate of cuprous oxide is controlled by the diffusion of copper ions, the effect of oxygen pressure upon the sintering rate was measured. The sintering rate increased with the oxygen pressure as predicted, but the results were not in quantitative agreement with the Wagner theory. 13 ref.
(H15, 3-24; Cu)

47-H. Metal and Self-Bonded Silicon Carbide. Pt. 3. R. E. Wilson. New York State College of Ceramics, Alfred University (Wright Air Department Center), *U.S. Office of Technical Services,* PB 121353, Jan. 1956, 33 p. $1.

Research toward development of a strong, high-temperature silicon carbide through the formation of dense, self-bonded material, and the bonding of silicon carbide by various metals, silicides, carbides and oxides. Aluminum and iron, added in amounts of 1-3%, had a marked effect on the density achieved in hot pressing silicon carbide. Molybdenum silicon carbide compositions were investigated in detail.
(H general; Si, Mo, 6-19)

48-H. Ceramic Fiber Base Cermets. Pt. 3. L. J. Trostel. Ohio State University Research (Wright Air Development Center), *U.S. Office of Technical Services,* PB 121354, Mar. 1956, 29 p. $.75.

Feasibility of developing a high-temperature prototype of fiber glass resin plastics investigated; three ceramic fiber-base cermets containing 91% 302B stainless steel and 9% ceramic fibers were fabricated.
(H17; SS)

49-H. Vibratory Compacting of Metal and Ceramic Powders. Pt. 3. W. C. Bell and J. R. Hart. North Carolina College (Wright Air Development Center). *U.S. Office of Technical Services,* PB 121255, Mar. 1956, 54 p. $1.50.

Forming, sintering and evaluation of materials for use as turbine blade materials, with primary concern for the influence of particle size distribution on the sintering characteristics and physical properties of alumina, 15% nickel, 85% titanium carbide and 30% chromium, 70% aluminum oxide compositions; application of vibratory, impact and hydrostatic forces in the forming of those compositions from powders.
(H14, H15, T7h, 17-7)

50-H. (Japanese.) **Cermets.** Fumihei Yoshiki. *Japan Society of Mechanical Engineers, Journal,* v. 60, Mar. 1957, p. 267-274.

Physical properties of oxide and carbide-base cermets. 26 ref.
(H general, Q general; 6-20)

51-H. (French.) **Manufacture, Properties and Use of Electrical and Magnetic Materials Obtained by Sintering.** M. Eudier. *Metallurgie et la Construction Mecanique,* v. 89, May 1957, p. 421-428.

This method of producing workpieces is most advantageous in the case of metals with a high melting point (tungsten, molybdenum) which would be costly to machine; it is also applicable to other mixtures of metals and other compounds; and is the best means of treating the very pure metals obtained by evaporation. Notes the various processes to be used, difficulties to be overcome and recommended methods. (H general; SGA-r, SGA-n)

52-H. Production of High Purity Uranium Powder. G. Bellamy and J. H. Buddery. *Nuclear Power,* v. 2, May 1957, p. 175-179.

Powder metallurgy can produce shapes in fissionable material to final size if the right type of powder is available. Glove box methods used at Harwell described.
(H general, T11; U)

53-H. Thermal Etching of Titanium. P. Evans. *Acta Metallurgica,* v. 5, June 1957, p. 342-345. (CMA)

Thermal etching occurred in the sintering of titanium sheet rolled directly from powder. Pure argon was used in sintering from 8-21 hr. at 1400° C. The phase transformation resulting from furnace cooling rumpled the surface and obliterated all but grain-boundary etching. Etch terraces sometimes appear as curves, both smooth and polygonized. The polygonized etching is nearer the equilibrium configuration than the smooth curve but they differ only in degree. Growth mounds and large pits are present, but dislocation loops and inclusions were not apparent.
(H15, N6; Ti)

54-H. Powder Metallurgy Process. *Precision Metal Molding,* v. 15, May 1957, p. 51-56.

Production of parts by compaction and sintering of metal powders indicating accuracy obtainable, advantages and limitations. Twenty examples of parts produced by powder metallurgy. (H general)

55-H. (Japanese.) **Vacuum Hot Pressing of $MoSi_2$.** R. Takagi and K. Tamura. *Japan Institute of Metals, Journal,* v. 21, Mar. 1957, p. 169-172. (CMA)

An experimental vacuum hot press for refractory materials is described and results of test with $MoSi_2$ are noted. The density, electrical resistivity, hot hardness, corrosion resistance, oxidation and thermal shock as well as hot modulus of rupture of the pressed specimen were measured. The temperature used was 1430° C. The properties measured were better than those produced from cold pressing and vacuum sintering. (H14h, 1-23; Mo, *Si*)

56-H. New Horizons in Powder Metallurgy. Cord H. Sump. *Metal Progress,* v. 72, July 1957, p. 95-96, 116, 118.

Production of nickel and copper powders from low-grade raw materials; compacting of powder between rolls into strip; manufacture of felts from metallic fibers; rapid sintering activated by volatile salts in the compact. (H general)

57-H. (German.) **Influence of Pre and Post-Pressure and Sinter Temperature on Properties of Sintered Parts Manufactured From Metal Powders.** Gerhard Bockstiegel. *Archiv für das Eisenhüttenwesen,* v. 28, Mar. 1957, p. 167-177.

Specific weight, tensile strength, elongation prior to rupture, electrical conductivity and post-pressability of sintered samples of four powder metals produced either by reduction, electrolytical or mechanical crushing, and their dependence upon pressure (3 to 9 tons per sq. cm.) and sinter temperature (to 1250° C.). 16 ref. (H15p)

58-H. (German.) **Sintering in a Liquid Phase.** F. Eisenkolb and I. Kalning. *Planseeberichte für Pulvermetallurgie,* v. 5, Apr. 1957, p. 2-19.

Study of the mechanism of liquid-phase sintering using radioactive methods for determining the coefficients of self-diffusion, and comparing values obtained with those obtained by Kuczynski, *et al.* The effect on the sintering rate of inorganic salts or molten metals as the liquid phase; characteristic surface reactions which govern the rates of material transport, as opposed to the concept of self-diffusion as the governing process. 27 ref. (H15, N1d)

59-H. (Japanese.) **Aluminum Powder and Its Applications.** S. Imamura. *Metals,* v. 27, June 1957, p. 449-453.

Manufacture of aluminum powder; graining, atomizing, stamping and ball milling. Physical properties of aluminum powder—shapes, specific gravity, leafing properties, stability at various temperatures; applications. 3 ref.
(H general; Al, 17-7)

60-H. (Japanese.) **Vacuum Sintering.** Soichiro Asao. *Metals,* v. 27, June 1957, p. 493-498.

Atmospheres of sintering furnaces; furnace design; vacuum sintering of tantalum, titanium, zirconium and beryllium. 13 ref.
(H15q, 1-23, W26e; Ta, Ti, Zr, Be)

61-H. Production and Applications of Aluminum Powders and Pastes. *Metal Finishing,* v. 3, July 1957, p. 289-292, 298.

Early production methods; modern methods employed by Reynolds Metals. (To be continued.) (H10; Al)

62-H. Carbides, Carbide Components and High Vacuum Techniques. Peter Trippe. *Metalworking Production,* v. 101, May 3, 1957, p. 751-755.

Methods used in production and ball milling of tungsten carbide powder wax milling, green machining, pressing and high-vacuum sintering of components made from tungsten carbide or titanium carbide. (To be continued.)
(H general, 1-23; W, 6-19)

63-H. Submicron Metal Powders Make Sintered Parts as Strong and Dense as Solid Metal. M. W. Freeman and John H. L. Watson. *Product Engineering,* v. 28, June 1957, p. 182-184.

Iron, copper and nickel powders have been alloyed with each other and chemically combined with nylon, rubbers and other elastomeric materials and are at present being

produced by electrolytic process on a pilot-plant scale. Submicron powders, of particle size as fine as in tobacco smoke, have strong interparticle bonding.
(H10b, H16d, H12)

64-H. Preparation of Spherical Uranium Powder by Reduction of Uranium Trioxide With Calcium. A. P. Beard and F. K. Heumann. Knolls Atomic Power Laboratory. *U. S. Atomic Energy Commission,* KAPL-1380 (Del.), July 22, 1955, 32 p.

The reduction of uranium trioxide with calcium is a feasible technique of producing spherical uranium particles, which are of interest in development of long-lived fuel elements consisting of these particles dispersed in a ductile, nonfissionable metal or alloy. 14 ref.
(H10c; U)

65-H. Alumina-Base Cermets. Pt. 2. C. A. Hauck, E. W. Deadwyler and T. S. Shevlin. Ohio State University Research Foundation (Wright Air Development Center). *U. S. Office of Technical Services,* PB 121253, Mar. 1956, 44 p. $1.25.

Unsuccessful attempts to bond the ceramic oxide aluminum and five different metallic alloys for the purpose of developing cermet compositions possessing a high level of impact resistance with an adequate high-temperature strength and oxidation resistance. The major obstacle to the development and evaluation of alumina-base cermets containing the metals iron, nickel and cobalt is the unsolved problem of devising a means of promoting wetting between them.
(H general; Al, 6-20)

66-H. Why Cemented Carbides Behave as They Do. E. H. Despard. *Canadian Machinery,* v. 68, June 1957. p. 134-136, 246, 248.

Preparation, properties, compressive, tensile and transverse rupture strengths, wear, corrosion and shock resistance, porosity, chemical composition.
(H general, Q general; 6-19)

67-H. Could Powder Metallurgy Benefit You? George G. Karian. *Design Engineer,* June 1957, p. 53-57.

Five classes of powder parts now being commercially produced with brief descriptions of fabrication. Limitations, design and requirements of punches and dies.
(H general, 17-7; 6-22)

68-H. Furnace Sintering of Metals and Ceramics. R. L. Harper. *Metal Progress,* v. 72, Aug. 1957, p. 69-72.

Brief notes on temperatures, times and atmospheres for the well-known powders, plus remarks on reasons for vacuum sintering, the handling of mixtures for magnets and electronic "ferrites", as well as the metallizing of ceramic bodies so connections can be welded or soldered thereto. (H15, W26e, 1-2)

69-H. (Japanese.) **Formation of Titanium Carbide.** Masanao Nakagawa. *Chemical Society of Japan, Journal, Industrial Chemistry Section,* v. 60, Apr. 1957, p. 379-383. (CMA)

The reaction processes used in forming TiC were investigated by measuring volume decreases due to heating and the amounts of carbon in the carbide formed by sintering. Also studied were the equilibrium structures of the sintered mixtures at 1600 and 1800° C. 13 ref. (H general; Ti, 6-19)

70-H. (German.) **Conception of "Grinding Equilibrium" as Used in Powder Metallurgy.** Gustav F. Hüttig. *Zeitschrift für Metallkunde,* v. 48, June 1957, p. 352-356.

Concept of grinding equilibrium derived for milling arrangement independently of the intitial particle size. Predictions are tested on oil-water emulsions, copper powder and glass powders. 38 ref. (H10e)

71-H. Preparation of Metal Powders by Sodium Reduction. T. P. Whaley. Paper from "Symposium on Handling and Uses of the Alkali Metals". American Chemical Society, p. 129-137.

Finely divided iron, nickel, cobalt, manganese, cadmium, zinc, tin silver and copper were prepared by reaction of sodium dispersions with hydrocarbon suspensions or either solutions of their metal halides. The metal powders were separated from the by-product sodium chloride by leaching with deaerated water and drying the products under vacuum. 13 ref. (H10c; Fe, Ni, Co, Mn, Cd, Zn, Sn, Ag, Cu, *Na*)

72-H. Design for Metal-Powder Parts. Robert Talmage and John Kolb. *Product Engineering,* v. 28, p. 183-190.

Design suggestions for some basic shapes, economics, tooling problems and opportunities. 5 ref.
(H general, 17-1)

73-H. (Swedish.) **Production of Rolled Steel Directly From Pig Iron Powder.** Bo Kalling, Sven Eketorp and Sven Backstrom. *Jernkontorets Annaler*, v. 141, no. 6, 1957, p. 317-331.

A new process of producing rolled steel directly from granulated pig iron is described, where pig iron powder is mixed with about 15% of pure iron ore concentrates. The mixture is packed in a box of thin sheet and decarburized at 1100° C. and directly rolled to solid steel in the same heat. During the rolling operation the powder and the sheet cover are completely welded together. 11 ref. (H14j; Fe, ST)

74-H. (Italian.) **Production of Hollow Bodies by Means of Powder Metallurgy.** Salvatore Valente. *Ingegneria Meccanica*, v. 6, May 1957, p. 35-39.

Experiments designed to establish possibility of manufacture of hollow bodies by powder metallurgy and influence of use of a deformable core of, for example, lead, on the final quality of the part. Types of products that can be produced only by powder metallurgy, and those that can be produced by powder metal and traditional methods.
(H general, 6-22)

75-H. (Roumanian.) **Electrolytic Production of Copper Powders.** A. Calusaru. *Rivista de Chimie*, v. 8, May 1957, p. 369-375.

Experimental study: polarization, process of powder formation, optimum conditions for powder production, current efficiency, specific surface and volumetric weight of powders. 55 ref. (H10b; Cu)

76-H. Powder Metallurgy of Zirconium-Uranium Alloys. Herbert S. Kalish. *American Society for Metals, Transactions*, v. 50, Preprint no. 30, 1957, 31 p.

Uranium and zirconium powders were made by the hydride process. In the case of the alloys rich in zirconium, high density was readily obtained even sintered well below the melting point, whereas alloys in the range of 40% and more uranium required sintering very close to the melting point to obtain high density. It was found that the zirconium-uranium system was particularly amenable to powder metallurgy and homogeneous alloys were obtained in all compositions. 6 ref.
(H general; Zr, U)

77-H. Some Experiments on the Extrusion of Magnesium and Aluminum Powders. H. G. Cole. *Institute of Metals, Journal*, v. 86, Sept. 1957, p. 29-35.

Smooth extrusions of good mechanical properties can be made from magnesium powders at low extrusion speeds provided that the billet temperature exceeds 470° C. Alloy extrusions containing extra dispersed oxide can be made by extruding reactive mixtures of a metal powder with a metal-oxide powder. 14 ref. (H14k; Al, Mg)

78-H. Design for Metal-Powder Parts. Robert Talmage and John Kolb. *Metalworking Production*, v. 101 Sept. 27, 1957, p. 1737-1742.

Basic powder metallurgy process and data on part volume, weight dimensions and density as related to component design for shapes such as solid cylinder, flanged solid cylinder, flanged cylinder with holes and raised or recessed horizontal contour. (H general, 17-1)

79-H. Vacuum Sintering. Pt. 1. Theory and Practice. Henry H. Hausner. *Precision Metal Molding*, v. 15, Oct. 1957, p. 44-45, 88-89.

Role of vacuum as sintering atmosphere and effect on physical properties of metal powder compacts. 11 ref. (H15n, 1-23)

80-H. Extreme Precision Is Possible. Nathan H. Sanderson. *Precision Metal Molding*, v. 15, Nov. 1957, p. 42.

Powder metallurgical techniques can accomplish very high precision, but only where much higher than usual costs can be tolerated.
(H general, 17-3)

81-H. Controls Used in Powder Metallurgy. John H. Speck. *Precision Metal Molding*, v. 15, Nov. 1957, p. 82-83.

Controls for furnace temperature, powder, time, atmospheres and gas generators.
(H general, X general, 1-2)

82-H. Vacuum Sintering. Pt. 2. Henry H. Hausner. *Precision Metal Molding*, v. 15, Nov. 1957, p. 91-92, 94-95.

Possible use of very low pressures in the sintering of powdered metal parts. (H15n, 1-23)

83-H. (Russian.) **Some Regularities Observed in the Process of Compression of Powder Mixtures Used in the Preparation of Hard Alloys.** A. G. Samoilov. *Akademiya Nauk S.S.S.R., Izvestiya, Otdelenie Tekhnicheskikh*

Nauk, no. 2, Feb. 1957, p. 159-162. (CMA)

Many defects in articles prepared from compressed and sintered powders are traceable to defective compression. A study of this process, made with powders used in the preparation of known hard alloys (WC + 15% Co and WC + TiC + 6% Co) revealed some regularities in the interdependence of the pressure of the piston during compression, pressure of the piston during extrusion of the compressed sample, the difference between the pressures at both ends of the sample, the lateral surface of the sample, and the height of the sample. (H14; W, 6-19)

84-H. (German.) **Production of Metal Powder Machine and Instrument Parts.** Friedrich Eisenkolb. *Neue Hütte,* v. 2, Aug. 1957, p. 461-470.

Applications; production processes for iron, nonferrous metal and light metal powder; metal powder tests; metal powder designed for production of sintered steels and sintered alloys; preparation of super-fine powders and powders having special particle shapes. 40 ref. (H general)

85-H. (German.) **Production and Testing of Sintered Compacts Made of Alumina and Chromium.** Friedrich Eisenkolb and Werner Schatt. *Neue Hütte,* v. 2, Aug. 1957, p. 471-481.

Pretreatment, pressing and sintering of the powder mixtures; hardness, specific gravity, flexural breaking strength and tensile strength; influence of additions; shock stress behavior; corrosion and electric resistance tests. 25 ref.
(H general, Q general; Al, Cr, 6-22)

SECTION J

HEAT TREATMENT

1-J. **Some Aspects of Decarburisation.** F. H. Robinson. *Australasian Engineer,* v. 48, Sept. 1956, p. 42-51.

Chemical and physical mechanism, occurrence and importance in medium carbon and toolsteels, methods of detection, prevention and estimation of depths of decarburized skins. (J4a; CN, TS)

2-J. **Control Measures for the Heat Treatment of High Carbon Rods and Wire.** N. Dale Montgomery. *Wire and Wire Products,* v. 31, Nov. 1956, p. 1325-1326, 1390-1391.

Control measures instituted in annealing, patenting and oil tempering operations.
(J23, J25, J29; CN, 4-5, 4-11)

3-J. **Physical Principles of Electric Heating in an Electrolyte. I-II. Processes Developed for Heating (for Hardening) in an Electrolyte.** I. Z. Yasnogorodskii. *Henry Brutcher Translation Nos.* 3204, 3205, 3210, and 3211; 11, 26, 18 and 18 p. (From *Heating of Metals and Alloys in an Electrolyte,* Moscow, 1949, Chap. 1, Sec. 1-5; Chap. 2, Sec. 1-4.) Henry Brutcher, Altadena, Calif.

Consists in treating the work to be heated as a cathode in an aqueous electrolyte at about 120 to 160° F. with a direct current of about 200 volts. (J2)

4-J. (English.) **On the Heat Treatment of Ti-Ni Alloys.** Takashi Araki. *Journal of Mechanical Laboratory (Japan),* v. 2, no. 1, 1956, p. 28-31.

Investigation on the effects of quenching and isothermal heat treatment on the hardening and structure of the alloys with 2 - 12% nickel. (J26; Ti)

5-J. (French.) **The Heat Treatment of Light Alloys.** T. R. G. Williams. *Revue de Métallurgie,* v. 53, no. 10, Oct. 1956, p. 791-795.

Factors governing heat treatment, annealing, aging and stress relief annealing of aluminum and its alloys. (J general; Al)

6-J. (German.) **Investigation of Strain Hardened, Low-Carbon, Manganiferous Structural Steels After Annealing. II. Metallo-Physical Researches.** Friedrich Erdmann-Jesnitzer. *Neue Hütte,* v. 1, no. 8, Sept. 1956, p. 477-486.

Comparison of the phenomena in aging of steel with age hardening of duralumin. Variation of mechanical strength values including notched-bar impact strength of cold worked steels by means of annealing. (J23, J27, Q general; AY)

7-J. (German.) **Effect of Rim Decarburization in End Quench Hardenability Test of Steels.** Adolf Rose and Leo Rademacher. *Stahl und Eisen,* v. 76, no. 21, Oct. 18, 1956, p. 1366-1369.

Degree of rim decarburization, effect of quenching temperature and composition of steel. Cooling rates. (J4a, 18-1; ST)

8-J. **Continuous Salt Bath Treatment Improves Farm Tools.** *Industrial Heating,* v. 23, Nov. 1956, p. 2320 + 5 pages.

To minimize warpage and obtain optimum physical properties, tools are isothermally heat treated in a modern automatic electric salt bath installation. (J2j, T3)

9-J. **Simplified Heat Treatment of Piston Pins in Rotating Retort Furnace.** R. E. Haislip. *Industrial Heating,* v. 23, Nov. 1956, p. 2333 + 5 pages.

Gas carburizing, rotating retort furnace, endothermic atmosphere, quality control.
(J28g, J2k, W27; ST)

10-J. **How Measurements Lead to Effective Quenching.** Victor Paschkis and George Stolz, Jr. *Iron Age,* v. 178, Nov. 22, 1956, p. 95-97.

Effectiveness of an agitated quench, still water, quenching in brine. (J2m)

11-J. Controlled Atmospheres in Heat Treating. C. W. Sanzenbacher. *Iron and Steel Engineer,* v. 33, Nov. 1956, p. 71-76.

Types of prepared atmospheres, equipment required to generate them, applications in the steel industry. (J2k; ST)

12-J. Induction Hardening Operations on Crankshafts. *Machinery, (London),* v. 89, Nov. 16, 1956, p. 1122-1125.

Equipment and procedures. (J2g; ST)

13-J. Annealing With Superfast Cooling Option. Lester E. Alban and Harrold J. Bates. *Steel,* v. 139, Dec. 3, 1956, p. 150-152.

Cycle annealing furnace will continuously handle forgings in a wide assortment of sizes, shapes and alloys. (J23, W27; ST, 4-1)

14-J. The Range of Steels. J. D. Gilchrist. Paper from "Chemical Engineering Practice". v. II. Academic Press. p. 144-175.

Properties and heat treatment of various types of steel. (J general, Q general; ST)

15-J. (French.) **Induction Tempering for More Wear Resistance in Heat Engines and Machines.** G. W. Senlen. *Métallurgie et la Construction Mécanique,* v. 88, no. 10, Oct. 1956, p. 823 + 6 pages.

Principles and effects of induction tempering; properties of steels suitable for tempering. (J29, J2g; ST)

16-J. (Polish.) **Decarburizing Steel Wire.** Jozef Pechanski. *Hutnik,* v. 23, no. 9, Sept. 1956, p. 330-336.

Theory and mathematical analysis of the process, determination of the degree of decarburization, effects of furnace atmosphere. (J4a; ST, 4-11)

17-J. (Russian.) **Improvements in the Annealing of Transformer Steel.** N. F. Dubrov, G. A. Zykov and V. A. Koroleva. *Metallurg,* no. 10, Oct. 1956, p. 27-28.

Suggests redesign of the tunnel-type furnace to secure a lower temperature gradient and a more uniform annealing along the height of piled transformer steel. (J23, ST)

18-J. (French.) **Low-Alloy Heat Resistant Steels and Their Thermal Treatment.** G. Delbart and A. Constant. *Institut de Recherches de la Sidérurgie, Publications. ser. A,* no. 153, Oct. 1956, 16 p. (Rreprinted from "Metaux-Corrosion-Industries" no. 370, June 1956, p. 251-264.)

These steels, used in aircraft industry and steam plants, receive various heat treatments. Influence of these treatments on creep, relation between creep and secondary hardening. Use is limited by low resistance to oxidation. Various coatings are possible. (J general, Q23d; AY, SS-h)

19-J. (German.) **Further Development of the End-Quench Test for Testing the Hardenability of Deep-Hardening Steels.** Adolf Rose and Leo Rademacher. *Stahl und Eisen,* v. 76, no. 23, Nov. 15, 1956, p. 1570-1573.

The above is related to the time-temperature transformation diagram for continuous cooling. Application to hot working toolsteels. (J26, 18-1, N8g; TS)

20-J. (Russian.) **Effects of Heat Treatment on the Properties of Low-Carbon Rimmed Steel.** M. V. Pridantsev and Kh. Sh. Levinzon. *Stal',* v. 16, no. 11, Nov. 1956, p. 1006-1015.

Heat treating rimmed, low carbon steels at high cooling rates makes it possible to obtain practically non-aging metals with improved physical-mechanical properties which are satisfactory substitutes for killed steel and considerably cheaper. (J general, P general, Q general; ST, CN)

21-J. Modernization Can Cut Costs in Annealing Malleable Iron. Carl L. Ipsen. *Foundry,* v. 85, no. 1, Jan. 1957, p. 104-109.

Benefits obtained by modern heat treating furnaces, which are designed to provide temperature control, controlled atmosphere, flexibility in speed of production. (J23, W27; CI)

22-J. How to Get More Out of Beryllium Copper. John T. Richards. *Materials and Methods,* v. 44, no. 6, Dec. 1956, p. 112-114.

New heat treatments described and influence of beryllium content, rolled temper, aging temper, heating rate during aging, metal thickness and grain direction summarized. (J27d, Cu, *Be*)

23-J. Current Heat-Treatment Practice. R. J. Brown. *Metal Treatment And Drop Forging,* v. 23, Dec. 1956, p. 503-511.

Current furnace types; examples of all types of heat treatment. (J general, W27)

24-J. Fine Grained Brass for Deeper Draws. *Steel,* v. 139, Dec. 24, 1956, p. 66-67.

Continuous annealing of brass strip gives superior ductility and al-

lows fine finish.
(J23, 1-11, Q23p; Cu)

25-J. The Metallographic View. Point 29. Nitriding the Lower Alloy Steels. Howard E. Boyer. *Steel Processing,* v. 42, Dec. 1956, p. 700-701, 708.

Special alloy steels have the best nitriding properties, but a member of conventional alloy steels containing chromium, vanadium, manganese or molybdenum respond to ammonia gas nitriding. (J28k, M27; AY)

26-J. The Heat Treating Pilot Plant—A New Industrial Aid. H. Ross. *Steel Processing,* v. 42, Dec. 1956, p. 705-708.

Use of pilot plant enables manufacturers to anticipate and meet problems arising in commercial production; stimulates research.
(J general, A9j)

27-J. Gear Hardening Unit Brings Operating Savings. *Western Metals,* v. 14, Dec. 1956, p. 53-54.

Flame hardening of winch gears results in superior products and lower costs. (J2h, T7)

28-J. (French.) **Control Problems in Surface Hardening by Induction.** C. Di Pieri. *Metallurgie et la Construction Mecanique,* v. 88, no. 11. Nov. 1956, p. 931-937.

High-frequency electronic generators; matching loads, regulation of inductor current and control of generator power. (J2g, W28)

29-J. (Japanese.) **Heating of Aluminum Alloys.** Tadakazu Hatori. *Metals,* v. 26, Dec. 1956, p. 964-965.

Heat absorption characteristics of aluminum alloys, methods of heating, soaking time. (J2, P11k; Al)

30-J. Tempering of Plain Carbon Steels. E. D. Hyam and J. Nutting. *Iron and Steel,* v. 29, Dec. 8, 1956, p. 638-644.

Mechanical properties and microstructure; experimental methods for metallographic examination; microstructural analysis; Meyer index determinations and carbide particle size distributions.
(J29, N8a, Q29, CN)

31-J. Fourth Stage of Tempering. Kehsin Kuo. *Iron and Steel,* v. 29, Dec. 8, 1956, p. 645-650.

Experimental method for electrons, microscopic examination of alloy carbides precipitated, especially for molybdenum steels, vanadium and titanium steels and chromium steel; hardness measurements with increasing tempering temperature.
(J29, N8r, Q29; AY)

32-J. Tempering and Nitriding of 3% Chromium Steels. C. C. Hodgson and H. G. Baron. *Iron and Steel,* v. 29, Dec. 8, 1956, p. 623-628.

Influence of tempering temperature, duration of tempering and the carbon content of the steel on the response to nitriding of steels differing essentially only in carbon content. (J29, J28k; AY, *Cr*)

33-J. Safe Operation of Atmosphere Furnaces. J. Huebler. *Metal Progress,* v. 70, Dec. 1956, p. 79-83.

Furnace user's responsibility is to see that the equipment is in perfect working order, and to provide competent well-educated operators. Responsibilities of the manufacturer. 6 ref. (J2k, A7p, W27)

34-J. Heat Treating Forum on Technical Progress. *Steel,* v. 140, Jan. 7, 1957, p. 292-304.

Twenty of the industry's leaders briefly point out progress and trends. A few of the trends are more automation in heat treating, automatic atmosphere control, more compact furnaces.
(J general, W27, W28)

35-J. (Russian.) **Investigating the Recrystallization of Titanium and Its Alloys. Effect of Annealing Temperature on the Mechanical Properties and Microstructure of Titanium.** Ye. M. Savitsky and M. A. Tylkina. *Investiya Akademii Nauk SSSR, Otdelemiya Tecknicheskikh Nauk,* no. 10, Oct. 1956, p. 125-127.

Effect of annealing temperature in the range of 600-1300° F. on the structure and the mechanical properties of deformed titanium. Prior to tension and impact resistance tests, the iodic and magnothermic titanium specimens were annealed at 600, 700, 900, 1000, 1200 and 1300° F. for 1 hr. in evacuated quartz ampoules. (J23c, Q general, 2-14; Ti)

36-J. Carbonitride to Step Up Powder Iron Properties. Lars Troberg. *Iron Age,* v. 179, Jan. 10, 1957, p. 66-68.

Carburizing has limited usefulness for powder iron parts. Where higher hardness and hardenability are called for, carbonitriding is a helpful tool. (J28m; Fe, 6-22)

37-J. Complex Heat Patterns Flame-Harden Part. *Iron Age,* v. 179, Jan. 17, 1957, p. 83.

Apparatus for flame-hardening of hyperbolic roller part. (J2h, 1-2)

38-J. Effect of Nitrogen on Hardenability in Boron Steels. John C. Shyne and Eric R. Morgan. *Journal of Metals,* v. 9, Jan. 1957, p. 116, 117.

Theories and effects on hardenability of boron and nitrogen and their interaction in steel. 5 ref. (J5, AY, *B, N*)

39-J. Use of Isothermal Heat Treatments in France. Georges Stempfel. *Metal Progress,* v. 71, Jan. 1957, p. 100-102.

The lack of free interchange of technical information during World War II retarded the development and use of isothermal treatments in France but they are now in widespread use. (J26p, J2j; CN, AY, TS)

40-J. Induction Heating for Stress-Relieving Large Steel Cylinders. G. W. Seulen. *Metal Progress,* v. 71, Jan. 1957, p. 126-130.

Portable equipment in 100-kw. packages, converting line frequencies to 2000 or 10,000-cycle current, can efficiently and accurately heat treat welded seams in pipe and pressure vessels using built-up inductors (water cooled) or uncooled copper cable. (J1a, J2g, 1-2; ST, 7-1)

41-J. The Application of Induction Heating to the Surface Hardening of Steel. J. Hamilton. *Metallurgia,* v. 55, Jan. 1957, p. 3-7.

Outline of the principles of induction heating. Discussion of practical applications and types of generator available. Description of some typical installations. (J2g, 1-2; ST)

42-J. Rapid Quenching With Reduced Distortion. Robert F. Lutz. *Tooling and Production,* v. 22, Jan. 1957, p. 79-82.

An automatic batch-type furnace and Voluta 23 quenching oil permits heat treatment of variety of axle and gear parts. (J26n, W27, 1-2)

43-J. The Effect of Grain Size on the Mechanical Properties of Ferritic Nodular Irons. G. N. J. Gilbert. *British Cast Iron Research Association, Journal of Research and Development,* v. 6, Dec. 1956, p. 430-435.

Two-stage ferritizing anneal, consisting of heating at about 900° C. in the austenitic range and then at 690° C. below the critical range. Fine-grained materials have substantially increased proof stresses and are more ductile. (J23s, Q23p, 2-9; CI-r)

44-J. Qualitative Test for Si-Cr-W Shock Resisting Toolsteel. Sadao Koshiba, Kazno Tanaka and Tsuneo Kunou. *Hitachi Review,* v. 16, Nov. 1956, p. 19-21, 18.

Relation between the quenching temperature and hardness, tempering temperature and hardness. Hardenability, rate of deformation, mechanical properties at elevated temperatures. (J26, J29, J5, Q general, 2-12; TS-j)

45-J. Carbonitriding. J. Lomas. *Machinery, Lloyd,* v. 28, Dec. 22, 1956, p. 91.

Gas composition for carbonitriding and the relation of Rockwell hardness to carbon penetration depth in the steel surface. (J28m; ST)

46-J. Types of Furnace Atmospheres. Curtis H. Vaughan. *Metal Progress,* v. 71, Feb. 1957, p. 93-96.

Considers six basic sources for protective atmospheres, notes briefly their method of production, and variations in their constitution with variations in the operating equipment and the control settings. (J2k, B25; RM-g)

47-J. Instrumentation in the Heat Treatment of Steel. Part II—Importance of Instrumentation. W. F. Coxon. *Metal Treatment and Drop Forging,* v. 24, Jan. 1957, p. 7-10.

Method of controlling the important variables for successful heat treatment. (To be continued.) (J general, X general; ST)

48-J. Steel Heat Treating Highlights of 1956. Carl L. Ipsen. *Steel Processing,* v. 43, Jan. 1957, p. 17, 51.

Survey reports trends which include increasing automation, higher temperatures, greater use of controlled or protective atmospheres and more precise controls and instruments. (J general)

49-J. Investigation of Stress Relief Procedures for Titanium and Titanium Alloys. F. J. Gillig. *U.S. Air Force, Wright Air Development Center, Technical Report 55-510,* Aug. 1956, 82 p. (PB 1216570). Abstracted in *U.S. Government Research Reports,* v. 27, Jan. 18, 1957, p. 19. (CMA)

A critical examination of residual stresses in titanium aircraft parts includes discussion of the build-up of residual stress and the difference between macro and micro stresses. A means of thermally reducing the residual stresses was evolved and stress relief procedures are outlined. Strain relaxation tests were conducted with four titanium compositions. (J1a, Q25h; Ti)

50-J. A Study of the Mechanisms of Heat Treatment of Zirconium-Base Alloys. Status Report for July 1, 1955-Feb. 29, 1956. R. F. Domagala, et al. *U.S. Atomic Energy Commission AECU-3191,* Mar. 1956, 9 p. (CMA)

Variation of mechanical properties studied in the course of establishing the transformation kinetics of zirconium binary alloys. Zr-Sn and Zr-Ti alloys, unsuitable for heat treatment, transform rapidly when quenched from the β field. Zr-Mo responds to heat treatment with variation of mechanical properties; embrittlement is attributed to the ω-phase. High hardness in Zr-Cb and Zr-Th has the same cause. (J general, N6p, Q general; Zr, *Ti, Mo, Cb,* Th)

51-J. A Study of the Short-Time Annealing of Cold Worked Zirconium. D. E. Johnson. *U.S. Atomic Energy Commission. HW-41372,* Feb. 29, 1956, 33 p. (CMA)

Short-time annealing of cold worked zirconium studied at 650, 700, 750, 800 and 825° C. for times ranging from 0.25 min. to 8 hr. Tensile properties and ductility were tested. A short anneal restores ductility in cold worked zirconium as effectively as the longer commercial anneals; 1 min. at 750° C. was best for 25% cold worked zirconium and 0.5 min. at 750° C. was best for 65% cold worked zirconium. Water quenches followed. Recrystallization is complete after 2 min. at 750° C. (J23, Q23p; Zr)

52-J. Heat Treatment of Carbon and Low Alloy Pressure-Vessel Steels. O. R. Carpenter and C. Floyd. *Welding Journal,* v. 36, Feb. 1957, p. 67s-76s.

Pressure vessel code interpretive report describes code requirements, recommended heat treatment practices and forming procedures for pressure-vessel steels. 13 ref. (J general, S22; CN, AY)

53-J. (Russian.) **Investigating the Recrystallization of Titanium and Its Alloys. 3. Effect of Annealing Temperature on the Mechanical Properties and Microstructure of Titanium.** Ye. M. Savitskiy and M. A. Tylkina. *Izvestiya Akademii Nauk SSSR, Otdelaniya Tekhnicheskikh Nauk,* no. 10, Oct. 1956, p. 125-127.

Studies the effect of annealing temperature in the range of 600-1300° C. on the structure and the mechanical properties of deformed titanium. Prior to tension and impact resistance tests, the iodic and magneothermic titanium specimens were annealed at 600, 700, 900, 1000, 1200 and 1300° C. for 1 hr. in evacuated quartz ampoules. Mechanical properties were found to be sensitive indices of structural changes in titanium resulting from heat treatment. The heating of all the tested titaniums to above 1000° C. always resulted in the preservation of the contours of beta-modification grains after cooling and a transition into the alpha prime form, and considerably decreases the mechanical and especially the plastic properties of titanium. (J23c, 2-11, N5; Ti)

54-J. (Book—German.) **Introduction to Annealing.** Wilhelm Ordinanz. 243 p. 1956. Carl Hanser Verlag, Kolbergerstr. 22, Muenchen 27, Germany.

Introduction to fundamentals and practice. Procedures, materials and their commercial application. Descriptions of modern heat treatment, particularly of steel. Exact instructions for different grades of steel. 69 ref. (J23; ST)

55-J. Integrated Setup Cleans and Stress Relieves Castings. W. G. Patton. *Iron Age,* v. 179, Feb. 7, 1957, p. 112-113.

Automatic transmission plant connects stress-relieving furnace by conveyer with a Kolene salt bath to ready castings for machining. (J1a, L12n; CI)

56-J. Kinetics of Nitridation of Magnesium and Aluminum. Prasom Sthapitanoda and John L. Margrave. *Journal of Physical Chemistry,* v. 60, Dec. 1956, p. 1628-1633.

Research on kinetics of nitriding as a function of time, temperature, pressure and surface penetration. A manometric apparatus was used for all of the measurements. (J28k, 1-4; Mg, Al)

57-J. Today's Quenching Needs. S. J. Barber. *Metal Treating,* v. 8, Jan.-Feb. 1957, p. 2-6; disc., p. 28-29.

Advantages, disadvantages, and effects of quenching media and list of common-sense quenching hints. (J26)

58-J. A Note on the Furnace Cracking of an Austenitic Stainless Steel. F. A. Hodierne. *Iron and Steel Institute, Journal,* v. 185, Feb. 1957, p. 225-227.

Cold drawn tubes in an 18-10 austenitic stainless steel containing

columbium cracked transversely on heating for interpass softening. This cracking was reproduced experimentally in a laboratory test at temperatures between 650 and 950° C., and appears to be associated with the precipitation of intergranular carbides in a steel with high internal stress. Cracking has been avoided in practice by precipitating the carbides at 850° C. before cold drawing the tubes. (J27, 9-22; SS-e)

59-J. Heat Treatment Restores Ductility to Forged Titanium Alloys. D. N. Williams and R. I. Jaffee. *Journal of Metals,* v. 9, Feb. 1957, p. 254-260. (CMA)

The high rejection rate of forged Ti-140A compressor wheels on the basis of inadequate ductility made their reclamation desirable. Heat treatment studies were conducted on wheels of Ti-140A and RC-130B. Annealing about 100° F. below β transus, cooling to the stabilization temperature and stabilizing is a beneficial treatment; α is dissolved until only nucleation sites remain. Higher ductilities were thus developed in Ti-140A than in RC-130B. 3 ref. (J23, Q23p; Ti, 4-1)

60-J. (English.) **On the Distortion of Ball Bearing Steel.** Akira Adachi and Zim-Ichro Morita. *Osaka University, Technology Reports,* v. 6, Mar. 1956, p. 133-139.

Using standard specimens the distortion of ball bearing steel was studied after various heat treatments. From the results of experiments, it was found that by good hardening operations the thermal strain could be eliminated, except the unavoidable transformation strain. 10 ref.
(J general, Q25p, 9-24, T7d; ST)

61-J. Controlled Atmospheres for Heat Treatment. Akira Adachi and Shimtaro Yamada. *Osaka University, Technology Reports,* v. 5, Oct. 1955, p. 419-423.

The composition of generated gases from town gas, propane gas, gasoline and kerosene, and the effect of the atmosphere for heated steel. 5 ref. (J2k; NM-g)

62-J. (English.) **Heat Treatment With Salt Baths in France.** *Aciers Fins et Spéciaux Francais,* no. 24, Dec. 1956, p. 31-34.

Use of salt baths as a method of heating for hardening and tempering steels; isothermal treatments (bainitic hardening and isothermal tempering) and hardening by stages; case-hardening salts and tempering salts; salt bath furnaces. (J2j; ST)

63-J. (French.) **Cementation Steels.** J. Marcovi and P. Tordjman. *Métallurgie et la Construction Mécanique,* v. 89, Jan. 1957, p. 43-47.

Lists the principal grades of cementation steels, with their analysis, mechanical properties and a few particulars concerning their processing and errors to be avoided. Details on the processing of steel cover forging, annealing and normalizing, and cementation. (J28, J23, J24, ST)

64-J. (German.) **The XII Heat-Treating Symposium, Oct. 18 and 19, 1956, Stuttgart, Germany, Oct. 23 and 24, 1956, Essen, Germany. A Summary of the Proceedings.** *Draht,* v. 8, Jan. 1956, p. 13-17.

Automation and mechanization of heat treatment processes and equipment were principal subjects discussed. Individual lectures are abstracted. (J general, 18-24)

65-J. Carburize, Martemper Parts in Single-Line Setup. C. E. Kopp. *Iron Age,* v. 179, Feb. 28, 1957, p. 82-83.

Among the advantages of mechanized salt bath line for carburizing and martempering of outboard motor crankshafts are uniform carburization of all surfaces with assured penetration, close temperature control and minimized distortion.
(J2j, J26p, J28g; ST)

66-J. Investigation of the Annealing of Deformed Nickel Powder by X-Ray and Stored Energy Measurements. D. Michell and F. D. Haig. *Philosophical Magazine,* v. 2, Series 8, Jan. 1957, p. 15-32.

The stored energy was measured by a calorimetric method. The measured value of 3.6 cal. per g. and the manner of its release suggests that a wide range of deformation is present. The diffraction patterns, measured with a Geiger counter spectrometer, show that during annealing there is no change in the background intensity. 16 ref.
(J23, 1-4; Ni)

67-J. A Survey of the Types of Furnace Atmospheres. C. H. Vaughan. *Steel Processing and Conversion,* v. 43, Feb. 1957, p. 96-98; disc., p. 100-103.

Types of furnace atmosphere gases, principal components and effects. Six basic atmospheres are considered: exothermically produced combustion gas, endothermically pro-

duced combustion gas, nitrogen, dissociated ammonia, hydrogen and argon and helium. (J2k, B25; RM-g)

68-J. Structure and Hardness of Liquid Nitrided Cases. Howard E. Boyer. *Steel Processing and Conversion,* v. 43, Feb. 1957, p. 84; disc., p-105-106.

Micrographs and depth hardness chart of three alloy steels after salt bath nitriding, namely, a high speed, AMS 6470, and a stainless steel. (J28k, M27, Q29n; TS-m, AY, SS)

69-J. (Italian.) **Determination of Specifications of Induction Heat Treating Plants.** Ciro di Piero. *Ingegneria Meccanica,* v. 5, March 1956, p. 5-15.

Review of basic principles of induction heat treating followed by presentation of factors permitting determination of power transformance into heat, efficiency of heat treating operation, time required for process, and power requirements, both for annealing and surface hardening. (J2g)

70-J. Effect of Annealing in Various Gases on the Bulk Lifetime of Germanium. Kurt Weiser. *Journal of Applied Physics,* v. 28, Feb. 1957, p. 271-272.

High-resistivity germanium crystals were annealed at 500° C. in various gases. For an oxygen atmosphere with a trace of water vapor present, the bulk lifetime more than doubled, then decreased to below the initial value. (J23, J2k; Ge)

71-J. Slack Quenching of Steels. D. J. Blickwede and R. C. Hess. *Metal Progress,* v. 71, Mar. 1957, p. 97-103.

Quenching diagrams are presented for several common engineering alloy steels which enable the metallurgist to predict the course of transformation and the eventual microstructures and hardnesses of various size parts quenched either in oil or water. (J26n, N8p; ST)

72-J. Applications of Furnace Atmospheres. Clarence E. Peck. *Metal Progress,* v. 71, Mar. 1957, p. 104-112.

Prepared atmospheres are specified for bright annealing, bright hardening and for carburizing or carbonitriding of all varieties of plain and alloy steels, and suggestions given (devised from experience) as to the atmospheres conventionally used, their dew points and their carbon "potentials". (J2k; CN, AY, TS, SS)

73-J. Vacuum Heat Treat Furnace Makes Titanium Parts Ductile. *Modern Metals,* v. 13, Mar. 1957, p. 76. (CMA)

Valuable hydrogen embrittled scrap has been salvaged by vacuum heat treating in a furnace designed by the Pacific Scientific Co. The furnace has been operated above 2000° F. and at pressures as low as 0.2μ. The components and the typical out-gassing cycle are described; a 6-hr. minimum has been established for sheet materials. Tear and notch tensile properties of titanium sheet are increased fourfold. Fabricators of A-286 alloy say that formability improves with solution heat treating. (J27a, W27, 1-23, Q23p; Ti)

74-J. Induction Heating for the Interstage Annealing of Components on High-Speed Press Lines. K. A. Zandstra. *Sheet Metal Industries,* v. 34, Mar. 1957, p. 177-188.

Types of heating coils and supports. Work handling equipment for various types of coils. Cups drawn of rimming steel annealed at 600 or 900° C. in less than 2 min. Advantages include less danger of grain growth, small amount of scaling, high over-all economy and flexibility. (J23, J2g, 1-2; ST-d)

75-J. Surface Hardening of Titanium With Metalloid Elements. R. W. Hanzel and V. Pulsifer. U.S. Watertown Arsenal Laboratory. Report 401/84-25, May 1953. *U.S. Office of Technical Services,* PB 111821, 151 p. (CMA)

Surface hardening processes for titanium were studied, including those based on the hardening effects of nitrogen and oxygen, carburizing and hydrogen addition. Data for treating titanium with molten borax, fused salt baths and dissociated ammonia. (J27, J28, 2-10; Ti)

76-J. (Spanish.) **Experimental Verification of Lamont Curves on a 0.97% C, 1.44% Cr Steel.** Mario Pujol Roig. From "Papers Presented at 28th International Congress of Industrial Chemistry", 1956, 9 p.

Tests carried out to determine whether Lamont curves are equally applicable to this type of steel as to steels of up to 0.6% carbon content and low-alloy steels. Author concludes that only approximate values can be obtained. Study also shows why, in this type of steel, Jominy curve cannot be calculated on the basis of chemical composition and grain size. 14 ref. (J5; AY, *Cr*)

77-J. Rockets for Steel Hardening. James A. Browning. *Welding Journal,* v. 36, Mar. 1957, p. 225-229.

Small rockets fueled by oxygen and propane have been investigated for the flame hardening of steel. The extremely fast heating rates followed by a water quench produce hardness values higher than those obtained by more conventional heating techniques. (J2h, 1-2; ST)

78-J. Some Thoughts on Spring Heat-Treatment and Finishing. E. Mitchell. *Wire Production,* v. 6, Jan. 1957, p. 5-13.

Hardening, tempering, austempering and finishing discussed. (J26, J29; T7c)

79-J. (French.) **Case-Hardened Steels.** J. Marcovici and P. Tordjmann. *Métallurgie et la Construction Mécanique,* v. 89, Feb. 1957, p. 117-121.

Practical notes on case hardening; depth of case hardened layer, types of case hardening, carbon content of case hardened layer; grinding after case hardening and precautions to be taken; tempering of case hardened workpieces; remarks on the transformation range. (Concluded.) (J28; ST)

80-J. (Italian.) **Radiofrequency Electronic Induction Generators for Heat Treatment. Constructional and Operational Factors, Auxiliary Mechanical Equipment.** Antonio Tescari. *Ingegneria Meccanica,* v. 5, Mar. 1956, p. 17-29.

Examination of surroundings of proposed installation; practical considerations when equipment is to be handled by personnel without special training in electronics; construction specifications; mechanical accessories required to make installation technically acceptable and economically profitable. 15 ref. (J2g, 1-2)

81-J. (Italian.) **Economic Aspects of Heat Treatment of Materials That Are Good Conductors of Electricity by Means of Radio Frequency Generators.** Giancarlo Giacometti. *Ingegneria Meccanica,* v. 5, Mar. 1956, p. 31-34.

Advantages of use of radio frequency generators for heat treatment of metal and metal alloys; operating frequency and power requirements and cost. (J2g, 1-2, 17-3)

82-J. (Spanish.) **Deformation Duc to Hardening in 12% Cr, 2% C Ledeburitic Steel.** Francisco Joanxich Ayma. From "Papers Presented at 3rd General Assembly of the Iron and Steel Institute". 1956. 11 p.

Influence of carbides on deformation. Three specimens of toolsteel studied after hardening and tempering at temperatures ranging from 930 to 1010° C. and 200 to 500° C. for respective operations; 1010° and 500° produced high degrees of hardness that supposedly would be improved by increasing tempering temperature to a point between 500 and 600° C., while at the same time keeping deformation to an acceptable minimum. 10 ref. (J29, 9-24; TS)

83-J. Annealing and Hardening Copper Coils. Albert Romeo. *Industrial Gas,* v. 35, Mar. 1957, p. 14-15.

Less handling is required, quality is better controlled, and production is increased when copper alloy coils are treated in pit-type furnace. (J23, W27; Cu, 4-11)

84-J. Basic Furnace Atmospheres and Composition Effects. C. H. Vaughan. *Industrial Heating,* v. 24, Feb. 1957, p. 248-258, 424.

Basic types of furnace atmospheres are exothermically produced combustion gas, endothermically produced combustion gas, nitrogen, dissociated ammonia, hydrogen, argon and helium. Their production, variations, compositions and influence on metals being treated. (J2k, B25; RM-g)

85-J. High Quality Gears and Assembly Parts Require Precise Heat Treating. John T. Mitchell and Russell Buyea. *Industrial Heating,* v. 24, Feb. 1957, p. 260-268, 274.

Continuous and vast equipment and processes for normalizing and carburizing SAE 8125 steel gears and shafts. Parts made from SAE 1030 and 1035 steel cyanided. (J24, J28g, J28j, 1-2; AY, CN)

86-J. Selection and Application of Furnace Atmospheres for Quality Control. O. E. Cullen. *Industrial Heating,* v. 24, Mar. 1957, p. 465-474.

Atmosphere composition for carburizing, carbonitriding and recarburizing; studies of atmosphere composition emphasizes need for careful measurements and control of dew point and other minor as well as major constituents. (J2k; RM-g)

87-J. Steam Atmosphere Heat Treating Promotes Special Metal Characteristics. F. L. Spangler. *Industrial Heating,* v. 24, Mar. 1957, p. 478-488.

Equipment, process and applications to both ferrous and nonferrous parts. Tough oxide film gives advantages such as superior wear resistance, better machinability, greater corrosion resistance and clean parts for use of subsequent coating processes. (J2k, RM-g32)

88-J. Symposium on Continuous Annealing of Steel Strip. Papers Presented by Horace Drever, C. E. Peck, H. W. Lynn and E. B. Fitzgerald. *Iron and Steel Engineer,* v. 34, Feb. 1957, p. 69-94.

History; advantages of continuous versus batch annealing; heating and cooling cycles; furnaces and needed improvements; mechanical equipment; electrical drives. (J23, 1-11, 1-2; ST)

89-J. High-Vacuum Annealing. Werner Herdieckerhoff. *Draht* (English Edition), no. 27, Feb. 1957, p. 38-40.

Conventional equipment and principles of operation; description and advantages of high-vacuum annealing unit; applications include copper and nickel, wire and strip; high, low or special alloy steel strips. (J23, 1-23, 1-2, Cu, Ni, AY)

90-J. Low-Temperature Annealing of Drawn Wire. Kenichi Nakamura and Yoshimune Nakamura. *Mechanical Laboratory of Japan, Journal,* v. 2, no. 2, 1956, p. 25-28.

Investigation of the hardening phenomena that occur when low-temperature annealing is conducted on carbon steel wire that has been drawn through a die, and the determination of appropriate conditions for improving the mechanical properties of drawn wires under such annealing procedures. 7 ref. (J23; CN, 4-11)

91-J. Steel Heat Treatment and Furnace Atmosphere. *Mechanical World and Engineering Record,* Mar. 1957, p. 127-129.

Recent developments avoid scaling or decarburization and enable bright finishes to be maintained. (J2k; ST)

92-J. (French.) **Cementation.** G. de Smet. *Pratique des Industries Mécaniques,* v. 40, Jan. 1957, p. 1-10.

Case hardening; description of the process of carbonitriding and gas carburizing; various methods and equipment described. (To be continued.) (J28, 1-2)

93-J. (German.) **Design, Mode of Operation and Operational Results of a Modern Wide Strip Annealing Plant.** Vincenz Seul and Joseph Billigmann. *Stahl und Eisen,* v. 77, Mar. 21, 1957, p. 309-323.

Features of development of the continuous strip annealing furnaces; advantages of continuous annealing; application of continuous annealing furnaces in America and Europe. Annealing furnaces with vertical and horizontal flow of the strip. (J23, W27, 1-11; ST, 4-3)

94-J Selection and Heat Treatment of Materials for Traction Gears. Heinrich Staudinger. *AEG Progress,* no. 3, 1956, p. 216-223.

Discussed with particular reference to the residual stresses which arise during the various processes employed for the surface hardening of steels. For a highly stressed spur gear, heat treatable steels with surface hardened teeth may often be used instead of the case hardening steels which were commonly used in the past. Surface hardening is then carried out by the induction or flame hardening method or even by dip hardening and nitriding of steels with a carbon content of about 0.35 to 0.45%. (J28, T7a; ST)

95-J. Heat Treatment of Titanium. P. D. Frost. *Metal Treating,* v. 8, Mar-Apr. 1957, p. 6-8, 31, 36, 50, 54. (CMA)

Four motives for heat treating titanium alloys. Improved strength results from solution treating to transform alpha to beta and dissolve manganese, iron and other additions, then air or water quenching to retain beta, and finally aging to control beta transformation to fine, dispersed alpha. Omega-phase embrittlement is avoided by aging sufficiently to permit the beta→alpha transformation mechanism in beta alloys to complete. The loss of ductility from working above the beta transus may be minimized by keeping the working range in the alpha-beta temperatures as much as possible. Contamination and distortion during heat treatment may be prevented by various means. (e.g., slat-quench and Mollerizing.) (J general; Ti)

96-J. Case-Hardening of Carbon and Alloy Steels. J. E. Jubb. *Metal Treatment and Drop Forging,* v. 24, Mar. 1957, p. 99-104, 106.

Metallurgical principles and practical aspects of box-carburizing with solid compounds and cyaniding in salt bath including packing, temperature and case depth control,

methods of refining grain in core and selective hardening; types of faults developed. (J28; CN, AY)

97-J. The Metallographic View—32. Metallographic Characteristics of Cyanided and Carbonitrided Cases. Howard E. Boyer. *Steel Processing and Conversion,* v. 43, Mar. 1957, p. 142-143, 170.

Hardness and microstructure study of case on SAE 1020 carbon steel formed by cyaniding in molten bath or by carbonitriding in gaseous atmosphere.
(J28j, J28m, M27, Q28n; CN)

98-J. Air Injection. A New Carburizing Control Technique in Zoned Atmosphere Furnace Operation. H. C. Harris. *Steel Processing and Conversion,* v. 43, Mar. 1957, p. 158-162.

Details of process and furnace for continuous gas carburizing of gears from variety of alloy steels including SAE 8620H and AISI 4023. Problem of maintaining surface carbon content of not more than 0.80% and still providing sufficient case depth met by close control of atmosphere consisting of propane and endothermic generator gas in the second and third zones of furnace, straight generator gas in the fourth and fifth zones with air introduced near discharge end of fifth and final zone.
(J2k, J28g, 1-11; AY)

99-J. Nitriding and Carbonitriding of Titanium Metal and Its Alloys. Final Technical Report. A. Styka. Watertown Arsenal Laboratory. Report 401/49/23. *U.S. Office of Technical Services,* PB 123974, Aug. 1953, 55 p. (CMA)

Hard adherent surfaces are produced on titanium and its alloys by nitriding in nitrogen and dissociated ammonia; the procedure is described. Impact and tensile strengths and structure were evaluated. Carbonitriding in propane, air and ammonia mixtures was studied for the effect of temperature, time and gas mixture. (J28k, J28m; Ti)

100-J. Direct Flame Hardening With Natural Gas. Arthur Q. Smith. *Industrial Gas,* Apr. 1957, p. 10-12.

Direct flame hardening allows use of lower cost steels and reduces subsequent machining costs. Single operation also saves valuable time. New equipment described.
(J2h, 1-2; RM-m35)

101-J. How Long, How Fast to Heat Tool Steel. Pt. 1. *Iron Age,* v. 179, Apr. 4, 1957, p. 79-99.

Effect of metal surface and furnace temperature on heating rate, difference between center and surface temperatures. (J2, 3-17; TS)

102-J. Hot Oil Quenching. L. W. Kalinowski. *Metal Treating,* v. 8, Mar-Apr. 1957, p. 10-12, 54-56, 59.

Processes for full and modified martempering of steels and advantages derived from use of hot oil compared to salts as quenching medium; benefits from using process on automotive clutch hubs, roller bearings and other steel parts; requirements and tests for quenching oils. (J26; ST, NM-h)

103-J. Principles and Practical Aspects of Titanium Heat Treatment. P. D. Frost. Battelle Memorial Institute. Report 8. *U.S. Office of Technical Services,* PB 124563, June 1955, 24 p. (CMA)

Beta-stabilizing additions make titanium heat treatable while aluminum increases high-temperature strength and improves hot working. All alpha-beta alloys respond to some degree of solution and aging heat treatments; the latter should exceed 800° F. to avoid embrittlement. Stress-relief temperatures should not be high enough to cause much transformation to beta, nor should alloys be hot worked above the beta transus.
(J27a, J1a, 1-10; Ti)

104-J. (French.) **Observations on the Heat Treatment of Aluminum-Zinc-Manganese-Copper Alloys.** M. Tournaire and G. M. Renouard. *Metaux-Corrosion-Industries,* no. 379, Mar. 1957, p. 95-101.

Study of the relationship between heat treatments and mechanical characteristics (elastic limit and breaking load) of these alloys.
(J general, Q21b, Q23; Al, *Zn, Mn, Cu*)

105-J. (German.) **Flame Hardening of Cast Iron.** E. A. Hohmann. *Giesserei-Praxis,* v. 75, Jan. 25, 1957, p. 47-49.

Flame hardened cast iron component surfaces show increased fatigue limits and a treble to quadruple work life. (J2h, Q7a; CI)

106-J. (Japanese.) **Heat Treatment of Copper Alloys.** Ko Tanaka and Kagno Sonobe. *Metals,* v. 27, Apr. 1957, p. 265-269.

Annealing for softening, segregation and aging; low-temperature annealing. (J23, J27d; Cu)

107-J. (Japanese.) **Heat Treatment of Alpha Solid Solutions of Copper Al-**

loys. Gungi Shinoda and K. Amano. *Metals,* v. 27, Apr. 1957, p. 270-275.

Mechanism of hardening by annealing; relation of annealing temperature and annealing time; aging of alpha solid solutions of copper alloys. 24 ref. (J23, J27d; Cu)

108-J. (Japanese.) **Heat Treatment of Aluminum Alloys.** Tojiro Kobayashi. *Metals,* v. 27, Apr. 1957, p. 278-282.

Characteristics of aluminum alloys with regard to heat treatment. (J general; Al)

109-J. (Japanese.) **Heat Treatment of Magnesium Alloys.** Michiyuki Tanji. *Metals,* v. 27, Apr. 1957, p. 283-288.

Heat treatment furnaces for use with magnesium alloys; mechanical properties of magnesium alloys. (J general, Q general, W27; Mg)

110-J. (Japanese.) **Heat Treatment of Zinc and Zinc Alloys.** Usabro Nishioka. *Metals,* v. 27, Apr. 1957, p. 289-294.

Results of heat treatment of zinc, zinc-aluminum alloys, zinc-copper alloys, zinc-magnesium alloys and diecast zinc alloys are evaluated on the Vicker's hardness scale. (J general, Q29c; Zn, 5-11)

111-J. (Japanese.) **Heat Treatment of Nickel Alloys.** Shinich Nakata. *Metals,* v. 27, Apr. 1957, p. 295-299.

Bright annealing, soft annealing, temper or semi-annealing, stress-equalizing annealing and age hardening of nickel alloys. (J23, J27d; Ni)

112-J. (Japanese.) **Heat Treatment of Noble Metals.** Yuzo Yoshikawa. *Metals,* v. 27, Apr. 1957, p. 301-303.

Palladium, platinum, platinum alloy, gold-silver-copper alloys, gold-platinum alloys, gold-platinum, palladium-silver-copper alloys are discussed. (J general; EG-c)

113-J. Instrumentation of a Continuous Batch-Type Annealing Furnace. R. H. Gelder and Walter E. Hand. *Instruments and Automation,* v. 30, Apr. 1957, p. 704-707.

A continuous method of annealing steel sheet and plate with improved instrumentation results in one-third higher production with half the Btu. output. (J23, 1-11, 1-2; ST)

114-J. Heat Treatment of Aluminum Alloy Forgings. C. Wilson and J. V. Scanlan. *Light Metals,* v. 20, Mar. 1957, p. 90-94.

Tables of nominal composition and heat treatment conditions of aluminum alloys currently being produced as forgings. Discussion of equipment, temperature control and problems encountered, such as internal stress, overheating, blistering. (J general, 1-2; Al, 4-1)

115-J. Heat-Treatment of Magnesium Alloys. N. Bailey. *Light Metals,* v. 20, Mar. 1957, p. 96-98.

Magnesium alloy and aluminum alloy heat treatment compared. (J general; Mg)

116-J. What You Should Known About Carburized Iron Powder Parts. W. J. Doelker. *Materials and Methods,* v. 45, Apr. 1957, p. 122-126.

Advantages, limitations and effect on properties of gas carburizing, liquid carburizing with salt, pack carburizing or mechanical pre-mixing for iron powder parts of low, medium or high densities. Mechanical properties of a few carburized electrolytic iron powder parts compared to wrought carbon steel. (J28g, Q general; Fe, 6-22)

117-J. Hardenability Test for Deep Hardening Steels. Carl M. Carman, Dominick F. Arminto and Harold Markus. *Metal Progress,* v. 71, May 1957, p. 77-80.

A 1.5 x 11-in. test piece is austenitized uniformly in a tube furnace, then lowered 2 in. and the protruding end cooled with a jet of water while the furnace is being cooled at a rate corresponding to the 3-in. position on the test piece. (J5, 1-4; AY)

118-J. Planning for Heat Treating in Malleable Iron Foundries. J. T. Bryce, L. E. Emery, F. W. Jacobs, L. R. Jenkins, G. B. Mannweiler and W. Zeunik. *Modern Castings,* v. 31, Feb. 1957, p. 39-54.

Summary of metallurgical practices which contribute to the production of white iron and selection of malleable heat treating furnaces, fuels and auxiliary control equipment. (J23b, 1-2; CI-s)

119-J. (French.) **Choice of Gear Steels and Their Heat Treatment.** O. Patterman. *Metallurgie et la Construction Mécanique,* v. 89, Apr. 1957, p. 337-344.

First part of a thorough survey. Characteristics of gear steels; appropriate heat treatments of the various types; nomenclature of Pompey and Roll steels; effect of the mass of work pieces on their char-

acteristics. (To be continued.) (J general, T7a, 17-7, 3-23; ST)

120-J. (French.) **Behavior of Nickel at High Temperatures—Heat and Mechanical Treatments.** *Revue de Nickel,* v. 23, Jan-Feb-Mar. 1957, p. 18-25.

Nickel is sensitive to the action of sulphur and to a somewhat less degree to that of oxygen. Enumerates precautions to be taken, before heating and during heating, to avoid deterioration and contamination of nickel during heat transformations and working.
(J general, N general, 2-12; Ni)

121-J. (German.) **Temperature Distribution of and Power Requirements for Inductive Heat Treatment of Circumferential Welds on Steel Tubes.** Herbert Geisel. *Schweissen und Schneiden,* v. 9, Apr. 1957, p. 156-161.

Local temperature variation along the axis of the tube during steady heat conduction; power requirements during the soaking period; heat stored during steady heat conduction; consideration of temperature as a function of heat conduction coefficient, the specific heat and convection coefficient (surface coefficient). 4 ref. (J2g; ST, 7-1, 4-10)

122-J. Thermal Principles of High-Frequency Inductive Surface Hardening. Kurt Kegel. *AEG Progress,* no. 3, 1956, p. 193-198.

Fundamental principles involved in the surface heating of steel described in relation to the electrical and thermal processes, and a procedure is derived whereby the approximate depth of hardness to be produced may be estimated. Validity of the procedure discussed, method of determining the temperature variation at the surface described. (J2g)

123-J. (Czech.) **Dependence of Nitrogen Content on the Amount of Carbon in Carbonitrided Cases.** Bohumil Prenosil. *Hutnické Listy,* v. 12, Mar. 1957, p. 222-227.

With increasing carbon content in carbonitrided specimens the amount of nitrogen decreases, this relation being more pronounced at 860 than at 900° C. The knowledge of the mutual relation between carbon and nitrogen content facilitates the attainment of desired carbon and nitrogen content in carbonitrided cases. 17 ref. (J28m)

124-J. (Czech.) **Influence of Heat Treatment of Railway Tires on Their Wear.** Slavomir Horejs. *Hutnické Listy,* v. 12, Mar. 1957, p. 277-288.

Through accelerated cooling of tires from the austenitizing temperature, accompanied at the same time by an increase of their hardness, it is possible to increase markedly their wear resistance. For this increase a partial or complete suppression of pro-eutectoid ferrite is decisive.
(J22, Q9n, T23s; ST, 17-7)

125-J. (Czech.) **Influence of Nitrogen on the Hardenability of Carbonitrided Cases and on the Isothermal Transformation of Austenite.** Bohumil Prenosil. *Hutnické Listy,* v. 12, Apr. 1957, p. 289-298.

The influence of the amount of nitrogen on the hardenability of carbonitrided cases in using the modified Jominy test; influence of the amount of nitrogen on the S-curve of the isothermal transformation of austenite containing carbon and nitrogen and on the temperature of the beginning of martensitic transformation. 13 ref.
(J5, N8g; ST, *N*)

126-J. (Czech.) **Recrystallization and Intermediate Thermal Treatment of Low-Carbon Steels During Cold Working.** Vladimir Vrzal. *Materialovy Sbornik,* 1956, p. 55-76.

On the basis of a general analysis of the physical processes going on within the steel during working, and of experimentally determined spatial diagrams of hardness variation and grain growth during annealing, an intermediate heat treatment is determined. (J23c; CN)

127-J. (Czech.) **Nitriding Against Corrosion.** Joseph Zboril. *Materialovy Sbornik,* 1956, p. 79-95.

Considering the high temperatures of the nitriding processes and in view of the necessity of the layer to be rapidly cooled, a special device was designed to be located inside a chamber furnace of the usual type. Various kinds of steel have been nitrided and the results verified by practical tests. 9 ref.
(T28k, 1-2; ST)

128-J. (German.) **Present State of Flame Hardening.** G. W. Grönegress. *Metalloberfläche,* v. 11, Jan. 1957, p. 7-11.

Flame hardening becomes more economical as the surface to be hardened becomes a smaller part of the over-all surface and with larger dimensions of the workpiece.

Application of temperature measuring instrument "milliskop" to secure evenness of hardening. Advantages of hardening machines. (J2h)

129-J. (Italian.) **For a Greater Popularity of the Jominy Hardenability Test.** M. Baj. *Metallurgia Italiana,* v. 49, Mar. 1957, p. 186-194, 211.

Examination is made of operating conditions of the Jominy test which is one of easy execution and fair reproducibility. The technical and economic aspects of the test are emphasized. It is a test intended to help producers and consumers of steel when selecting alloying elements and conditions for the best heat treatment. 48 ref. (J5, 1-4; ST)

130-J. (Italian.) **Surface Decarburization During Salt Bath Heat Treatment.** Armando Andreotti. *Rivista di Meccanica,* no. 153, Jan. 19, 1957, p. 27-31.

Causes of decarburization of ferrous metals; methods of controlling decarburizing power of the bath; corrective measures designed to eliminate or reduce decarburizing power. (J4a, J2j; ST)

131-J. Quench Hardening of Pure Gold as Observed by Internal Friction Methods. A. E. Roswell and A. S. Nowick. *Acta Metallurgica,* v. 5, Apr. 1957, p. 228-235.

Effect of heat treatment on the dislocation damping is studied in high-purity gold. Difference between quenched and furnace-cooled specimens observed and results interpreted. (J26, Q22; Au-a)

132-J. Induction Hardening of Automobile Rear Axles. P. Woodie. *Industrial Heating,* v. 24, Apr. 1957, p. 718-726, 730.

Equipment, procedure and advantages of induction hardening. Advantages are less distortion, fine grain structure, elimination of cleaning operation, automatic-type process, accurate and uniform hardening, ultimate strength obtained from carbon steel. (J2g, 1-2; CN)

133-J. Metallurgical Aspects in the Design and Operation of a Continuous Annealing Line. Pt. I. A. F. Mohri. *Industrial Heating,* v. 24, Apr. 1957, p. 740-750.

Experimental evaluation of influence on hardness of low-carbon steel strip, heating time, effective soaking time, cooling time, soaking temperature and quenching temperature; determination of influence of steel composition on hardness with different annealing cycles. (To be continued.) (J23, 1-11, Q29n, 1-2; ST)

134-J. Continuous Annealing Lines for Tinplate—Recent Trends and Problems. J. H. Hopper and A. Jakimovich. *Iron and Steel Engineer,* v. 34, Apr. 1957, p. 80-86.

Schematic layout of a typical continuous annealing line. Advantages are uniform product and higher strength, allowing thinner gage steel to be used with better corrosion resistance properties. 7 ref. (J23, 1-11; ST, *Sn*)

135-J. Stepped Austenitizing Treatment for 4340 Steel. E. P. Klier, Volker Weiss and George Sachs. *Journal of Metals,* v. 9, *AIME Translations,* v. 209, Apr. 1957, p. 424-425.

Note on hardenability and notched tensile properties after stepped or other austenitizing schedule. 6 ref. (J22, J5, Q27d; AY)

136-J. Flaking of Heavy Alloy Steel Section. C. R. Garr and A. R. Troiano. *Journal of Metals,* v. 9, *AIME Transactions,* v. 209, Apr. 1957, p. 445-449.

Investigates potential antiflaking heat treatment on 15-ton experimental heat of chromium-nickel-molybdenum steel produced in basic electric furnace with abnormally high hydrogen content; tested antiflaking isothermal heat treatment designed to produce completely pearlitic and completely bainitic microstructure; role of transformation stresses in flaking of steel sections. (J21; AY, 9-20)

137-J. Choosing the Right Quench. O. E. Cullen. *Steel,* v. 140, May 13, 1957, p. 123-126.

Commonly used steel quenching treatments and quenching media; suggestions for selecting quenching process, media and equipment. (J26, W28n, W28p, 1-2; ST)

138-J. Heat Treatment and Properties of the Uranium-5 w/o Zirconium Alloy. H. A. Saller, F. A. Rough and A. A. Bauer. *U.S. Atomic Energy Commission, BMI-915.* May 17, 1954. 28 p. (CMA)

Quenching the alloy from the gamma region gives a supersaturated alpha uranium. The reac-

tion is martensite-like and gives a hard alloy difficult to fabricate. The stresses built up may cause warping and rupture. These effects may best be avoided by isothermal heat treatments which do not alter the corrosion resistance to boiling water. Varying the heat treatment gives a wide range of properties. (J26; U, *Zr*)

139-J. Depth of Sulphur-Enriched Zone Produced When Sulphidizing Steel and Cast Iron. G. V. Karpenko. *Henry Brutcher Translation* No. 3932, 2 p. (From *Vestnik Mashinostroeniya,* v. 37, no. 2, 1957, p. 61-62.) Henry Brutcher, Altadena, Calif.

Literature data on depth of sulphidized case on iron alloy and their discrepancies. Use of labeled sulphur atoms for determining actual depths of penetration of sulphur into steel and cast iron. (J4c; ST, CI, *S*)

140-J. (French.) **Tempering of Cast Irons.** *Fonderie,* no. 135, Apr. 1957, p. 170-180.

Optimum chemical compositions and operating precautions to be observed in this hardening process. Irons selected usually are without alloying elements or in the case of alloyed types contain nickel, chromium, molybdenum. Such irons have a homogeneous structure and the addition of alloying elements serves to facilitate tempering. (J29; CI-q)

141-J. (French.) **Oil Hardening.** M. Guillemeau. *Trempe,* no. 33, Apr. 1957, p. 9-19.

Critical speed of hardening and variables which influence the cooling rate—the cooling power peculiar to the oil, operating conditions and factors inherent in the piece; practical results. (J26n; W28p; ST, NM-h)

142-J. Induction Hardening for Long Shafts. George H. De Groat. *American Machinist,* v. 101, Apr. 8, 1957, p. 120-121.

Induction heaters used in hardening and drawing of SAE 1037 rear axle drive shafts. (J2g, 1-2; CN)

143-J. Double Heat Treatment Strengthens Cast Wheels. Larry DeBoer. *Iron Age,* v. 179, Apr. 18, 1957, p. 116-117.

Equipment for cleaning, heat treating to spheroidize structure and cooling of cast freight car wheels. (J23r, L12, 1-2; CI)

144-J. New Nitriding Process Uses Glow Discharge. P. M. Unterweiser. *Iron Age,* v. 179, May 2, 1957, p. 91-93.

Basic principles and advantages of nitriding process depending on passage of high-current electrical energy through steel parts in a nitrogen and hydrogen atmosphere. Nitrogen is ionized in glow discharge and atomic nitrogen diffuses into two parts. Diffusion into aluminum-containing steel appeared better than by conventional methods. (J28k; AY, *Al*)

145-J. To Slash Machining Costs Deep Freeze Your Castings. *Modern Metals,* v. 13, Apr. 1957, p. 64-65.

Heat treated aluminum castings chilled to −120° F. for two 4-hr. periods to increase dimensional stability prior to machining. (J26q, G17; Al, 5)

146-J. Atmosphere Control. Pt. 2. Wayne Besselman. *Steel,* v. 140, May 27, 1957, p. 96-97.

Recommendations in selecting systems for sampling and analyzing atmosphere for continuous control of heat treating process. (J2k; 1-2)

147-J. Controlled Atmospheres. Pt. 1. C. E. Peck. *Steel Processing and Conversion,* v. 43, Apr. 1957, p. 215-218, 222, 223, 225, 226.

Surveys types of controlled atmospheres and summarizes their commercial application in bright annealing of low-carbon steel, tinplate, high-carbon, alloy steels, toolsteels and alloy bar stock, silicon steels and stainless steels. Bright hardening of steels and gas carburizing. (To be continued.) (J2k, J28g; CN, AY, SS)

148-J. (Russian.) **Application of Gaseous Cementation in the Gorky Milling Machine Factory.** D. A. Schwartz and D. A. Zhadaeva. *Stanki i Instrument,* v. 28, Feb. 1957, p. 38-39.

Gaseous cementation, an advanced chemico-thermal process, is widely used in mass production, competing with carburization. The deciding factor is length of process and feasibility of mechanization. Kerosene is used as source of carbon in shaft furnaces. Parts are charged into the furnace in baskets, or on adaptors. Depth of carburization varies from 0.2 to 2 mm. and concentration of carbon in the affected surface from 0.23 to 0.97%. (J28g; CN)

149-J. (Russian.) **Application of Liquid Cementation for Machine Tool Parts.** E. M. Morozova and F. R. Floren-

sova. *Stanki i Instrument,* v. 28, Feb. 1957, p. 40-41.

Cyanide is used often to carburize nuts, bolts and other parts. This, however, requires special precautions because of its poisonous character. Silicon carbide baths are simpler in application because no special conditions are required. The usual composition of the bath is 76-83% Na_2CO_3, 14-11% NaCl and 10-6% SiC. The last compound is the source of the carbon according to the formula: $2Na_2CO_3 + SiC \rightarrow Na_2SiO_3 + Na_2O + CO + C$.
(J28g, T7)

150-J. Control of Exothermic and Endothermic Converters. W. H. Holcroft. *Industrial Heating,* v. 24, Apr. 1957, p. 676-688.

Factors influencing analysis of converted gas and the measurement and maintenance of proper analysis for the heat treating job at hand. (J2k)

151-J. Production Line Heat Treatment of Aluminum-Alloy Fin Blades. Charles A. Boz and W. E. Coon. *Industrial Heating,* v. 24, Apr. 1957, p. 702-708.

Layout and operation of continuous line solution heat treatment furnace, quenching tank and aging furnace for fin blades made of 14S aluminum. (J27a, W27, 1-2; Al)

152-J. Heat Treatment of Transmission Gears. David Brown's New Plant. *Metallurgia,* v. 55, May 1957, p. 232-234.

Gas carburizing line, salt bath line and induction hardening line of a gear and small parts manufacturer for both large and small jobs.
(J28g, J2j, J2g, 1-2)

153-J. Steam Atmosphere Heat Treating Boosts Plant Operating Efficiency. F. L. Spangler. *Metal Treating,* v. 8, May-June 1957, p. 6-8.

Steam atmosphere heat treating produces oxide coating on iron and steel parts which protects parts against corrosion and gives superior wear resistance. Film is easily removed when further surface finishing is desired. Process is useful for annealing and stress-relieving brass, aging beryllium copper and solution treatment of aluminum; equipment for steam treating.
(J2k, 1-2; RM-g32)

154-J. Tool Steels. Pt. 1. Basic Concepts Governing Their Treatment. L. F. Spencer. *Steel Processing and Conversion,* v. 43, May 1957, p. 253-259, 286.

Emphasizes hardenability and other fundamental characteristics of toolsteels. Notes on heating for forging, normalizing, annealing, hardening processes with quenching rates and media, tempering, martempering and specialized heat treatments. Common problems encountered are distortion, cracking, overheating and decarburization. 6 ref.
(J general, F21b, J5; TS)

155-J. Controlled Atmospheres. A Survey of Their Types and Fields of Application in Metal Processing Operations. Pt. 2. C. E. Peck. *Steel Processing and Conversion,* v. 43, May 1957, p. 277-283, 285.

Discusses suitable atmospheres for bright annealing, bright hardening, tempering, carburizing, carbonitriding, sintering of powder compacts, brazing and soldering for most ferrous metals; lists atmospheres suitable for bright annealing or brazing of copper and copper alloys, aluminum and aluminum alloys, magnesium and magnesium alloys, nickel alloys and other nonferrous metals; outlines furnace types for use with controlled atmosphere. (J2k, 1-2)

156-J. Some Thoughts on Spring Heat Treatment and Finishing. E. Mitchell. *Wire Industry,* v. 24, June 1957, p. 561-569.

Hardening and tempering, austempering, effects of good and bad heat treatment, requirements and choice of equipment, atmospheres, finishing, barrelling and blueing of small carbon steel springs, with emphasis on common errors and malpractice.
(J26, J29, L10, L14; CN, SGA-b)

157-J. Effect of Various Heat Treatment Cycles Upon the Mechanical Properties of Titanium Alloys With Various Interstitial Levels. B. F. Hadley, G. W. Bauer and D. Evers. U.S. Air Force. Wright Air Development Center. Technical Report 56-580, *U.S. Office of Technical Services,* PB 131009, Mar. 1957, 220 p. (CMA)

Titanium alloy bars at five levels of interstitial content were studied for the effect of heat treatment on mechanical properties. The Ti-5Al complex and three other alloys were tested. The three types of heat treatment were (1) solution treatment and age cycle, (2) a step quench cycle and (3) a solution treatment, isothermal transformation cycle. Beta transi, TTT-curves and

end-quench curves were determined for all samples, and 300-hr. creep tests were made on some. Data were obtained on high-temperature tensile properties, room-temperature notch strength and Charpy impact. (J7a, J6p, Q27a, Q6n; Ti)

158-J. (French.) **Experimental Study of Dissolved Gases and Water Temperature on Cooling Rate During Water Tempering of Metals.** Roland Bigot and René Faivre. *Comptes Rendus,* v. 244, Mar. 18, 1957, p. 1639-1641.

Quantitative study of influence of CO_2, N_2, O_2 and air. Examination of greater effectiveness of cold-water tempering over hot. (J29)

159-J. (German.) **Present State of Malleablizing Furnaces in Germany.** Reinhard Opitz. *Giesserei,* v. 44, June 6, 1957, p. 342-346.

Survey of conventional and modern malleablizing furnace plants in Germany; malleablizing times and heat consumption of furnace plants with annealing pots and packing materials; description of furnace plants for white-heart and black-heart malleable cast iron; metallurgical prerequisites for the annealing of black-heart malleable cast iron. 7 ref. (J23b, 1-2; CI-s)

160-J. (German.) **Use of Carburized Samples to Determine Fitness of Carburizing Materials.** Kurt Kallhardt. *Härterei-Technische Mitteilungen,* v. 10, no. 1, 1956, p. 39-53.

For selecting carburizing materials with a C value (carburization value) below the saturation point of steel, the C value in itself is usually the determining factor. If the saturation point of steel is above the C value of the carburizing material the activity of the carburizing material is the determining factor. 7 ref. (J28, 1-4)

161-J. (German.) **Insulating Materials for Case Hardening.** Paul Birk. *Härterei-Technische Mitteilungen,* v. 10, no. 3, 1956, p. 9-19.

Possibilities of partial case hardening; removal of hardening layer; copper coating; covering by plastic materials; coating with liquid materials; testing of usual insulating materials; suitable insulating materials. (J28n)

162-J. (German.) **Material and Heat Treatment for Gear Wheels.** Heinrich Staudinger. *Härterei-Technische Mitteilungen,* v. 10, no. 3, 1956, p. 21-38.

Choice of materials, stability and wear, surface hardening in relation to stability, residual stress, surface hardening processes, induction hardening as a suitable method, behavior of materials. 19 ref. (J28, J1, J2g, T7a)

163-J. (German.) **Alloyed Case Hardening Steels.** Waldemar Breuer. *Härterei-Technische Mitteilungen,* v. 11, no. 1, 1956, p. 9-24.

Problems encountered with regard to surface hardness, core stability, strength, hardenability, machinability and deformability of nickel, molybdenum and vanadium alloyed case hardened steels. (J28, Q general, J5, G17k, AY, *Ni, Mo, V*)

164-J. (German.) **Heat Treatment of Structural Steel for Increased Structural Strength.** Heinrich Staudinger. *Härterei-Technische Mitteilungen,* v. 11, no. 1, 1956, p. 25-48.

Origin and influence of residual stress; heat treatment to increase fatigue limits of small cross sections; heat treatment, residual stress and fatigue limits of large cross sections; local surface hardening and residual stress obtained by heat treatment; errors in heat treatment and its results on fatigue strength. 22 ref. (J general, Q25h, Q7a; ST, SGB-s)

165-J. Annealing of Point Defects in Cold-Worked Molybdenum. D. G. Martin. *Acta Metallurgica,* v. 5, no. 7, July 1957, p. 371-376. (CMA)

A study of changes in the electrical resistance of cold worked molybdenum effected by annealing up to 400° C. showed that a point defect from cold worked anneals at 150° C. with an energy of migration of 1.26 ev. A relaxation of dislocations is presumed over a broad spectrum of activation energies. Iosthermal annealing curves do not have identical shapes. Estimating the number of defects on the basis of energy release on annealing is discussed. (J23, P15; Mo, 9)

166-J. Rapid Stress Relieving of Titanium Parts Without Distortion in New Car-Bottom Furnace. W. L. Timm. *Industrial Heating,* v. 24, June 1957, p. 1120-1122. (CMA)

Convair operates a car-bottom furnace which reduces the loading and unloading time entailed in stress-relieving titanium aircraft parts. Sheet is also straightened and warping is prevented. The furnace

and its operation are described. (J1a, W27, 1-2; Ti)

167-J. Study of Factors Influencing Surface Staining of Cold Rolled Steel. Pt. 1. Types of Defects and Their Occurrence. C. R. Lillie and D. W. Levinson. *Iron and Steel Engineer,* v. 34, May 1957, p. 69-73.

Considers and analyzes surface defect appearing on cold rolled steel strip known as "snaky edge"; determinations on effect of time, temperature, gas compositions, gas flow on surface staining during annealing; adjustment of annealing conditions to remove "snaky edges" produced commercially. (J23; SS, 9-21)

168-J. Study of Factors Influencing Surface Staining of Cold Rolled Steel. Pt. 2. Reaction Mechanism of Black Stain Formation on Annealed Steel Coils. F. V. Schossberger, K. Hattori and H. Marver. *Iron and Steel Engineer,* v. 34, May 1957, p. 74-81.

Laboratory study of the influence of DX gas and rolling oil on the formation of black edge. Effects of gas composition, gas flow, temperature and gap between steel sheets; black edges obtained from steel mills analyzed by electron and X-ray diffraction. 13 ref. (J23; SS, 9-21)

169-J. Hydrogen Control in Titanium. *Steel,* v. 141, July 1, 1957, p. 82. (CMA)

Martin Co. (Baltimore) saves time and money by subjecting titanium to a vacuum fusion analysis before using it in production to detect excess hydrogen. The procedure is described. The excess hydrogen may be removed by a vacuum annealing treatment. The Steel Improvement & Forge Co. (Cleveland) uses chemical analysis for hydrogen control. (J23, 1-23, S11r; Ti, *H*)

170-J. (German.) **Carburizing Effect of Various Carburizing Materials.** Karl Heinz Kopietz. *Harterei-Technische Mitteilungen,* v. 10, no. 1, 1956, p. 9-37.

Effect of recarburization; carburization materials and their effect; carburization values, activity, process; four recarburizing methods and customary additives; control methods; effect of carbide formed in steel on the carburization curve. 26 ref. (J28g)

171-J. (German.) **Grain Boundary Damage of a Cr-Ni-W Steel as a Consequence of Overheating.** Jerzy Ogerman. *Neue Hütte,* v. 2, May 1957, p. p. 289-299.

Influence of elevated heating temperatures (1200 to 1350° C.); heating time and cooling rate; degree of deformation and state of heat treatment upon the rupture appearance of a Cr-Ni-W steel. Grain boundary damages of steel at an annealing temperature up to 1250° C.; notched bar impact toughness of longitudinal test pieces at room temperature; ground section development of typical grains of the overheated state and new electrolytical etching method; interpretation of the causes of grain boundary damage. 32 ref. (J general; AY, 9-23)

172-J. (German.) **The Problem of the Life of Lead Bath Pots.** Hans Krautmacher and Wilhelm Pungel. *Stahl und Eisen,* v. 77, June 27, 1957, p. 837-845.

Materials tested, preliminary tests and test practice; corrosion rate as dependent on the annealing time and temperature; effect of the condition of material; service tests; annealing of plain carbon and alloy steels at a temperature of the lead bath of 720° C. for more than 300 hr. (J2j, 17-7; CN, AY, Pb)

173-J. (German.) **On the Use of Generator Gas as an Inert Gas in the Heat Treatment of Steel.** R. Meyer and F. Pawleck. *Werkstatt und Betrieb,* v. 90, Apr. 1957, p. 217-225.

Properties necessary and the suitability of generator gas are investigated; details of processing and economical use under various service conditions. 15 ref. (J2k; RM-g)

174-J. (German.) **Possibilities of High-Frequency Heating.** H. Grassmann and G. Meiners. *Werkstatt und Betrieb,* v. 90, Apr. 1957, p. 245-248.

The industrial high-frequency technique is a heating method which, through its extremely short-time requirements, can contribute to a rationalization of production. Industrial applications. (J2g)

175-J. (Japanese.) **Some Experiments on Residual Stress Relieving.** Akira Takaoki. *Iron and Steel Institute of Japan, Journal,* v. 43, Apr. 1957, p. 481-484.

In large forgings, such as for turbine rotors, it is important to relieve the residual stress. Stress-relieving experiments were studied

by the Sachs' boring-out method. The specimens (70 mm. diameter, 210 mm. long) were quenched in water from just below Ac_1 transformation temperature, and then reheated at various temperatures and for varying periods of time. (100 to 600° C., 1 to 90 hr.). 3 ref.
(J1a; ST, 4-1)

176-J. (Japanese.) **Annealing of Extruded Aluminum Rod.** Yoshikazu Hosoi, Eiichi Sawato and Mamoru Yukawa. *Light Metals,* v. 7, May 1957, p. 65-69.

The annealing curve for a pure aluminum specimen extruded at high temperature is similar to that for cold worked aluminum. The softening point varies according to the annealing method. Investigation of the hardness and electrical resistance of the specimens indicated that recrystallization took place during annealing, but X-ray diffraction patterns and microstructure did not clearly reveal that recrystallization resulted. 7 ref. (J23, N5; Al, 4-8)

177-J. (Norwegian.) **Heat Treatment of Aluminum Alloys.** R. Veimo. *Tidsskrift for Kjemi, Bergvesen og Metallurgi,* v. 16, no. 10, 1956, p. 189-198.

Heating in preparation for plastic forming; soft heating and partial annealing; homogenizing, precipitation, and stabilizing heat treatment. (J general; Al)

178-J. (Russian.) **Influence of Tempering Temperature Upon the Form of Graphite Inclusions in Malleable Cast Iron.** G. I. Ivantzov. *Liteinoe Proizvodstvo,* no. 5, May 1957, p. 25-26.

Tempering results at six different temperatures. 5 ref.
(J23b, 2-11; CI-s)

179-J. Effects of Acoustical Waves on the Annealing of Steels. H. V. Fairbanks and F. J. Dewee. *Acoustical Society of America,* v. 29, May 1957, p. 588-592.

Investigation to determine effect of ultrasonic energy on 0.07 and 1.05% carbon steels during transformation from austenite to ferrite under controlled cooling. The ultrasonic energy was produced by means of a bowl-shaped crystal of barium titanate and was coupled to the steel samples through distilled water. Ultrasonic frequencies of 400 and 1000 kc. were used. It was found that the ultrasonic treated samples of 0.07% carbon hypoeutectoid steel had finer grain size and greater hardness than the reference samples which had undergone the same heat treating cycle but no ultrasonic treatment. (J23; 1-24; CN)

180-J. Quench and Temper Process for the Manufacture of High Strength Tubular Products. H. B. Emerick. *Blast Furnace and Steel Plant,* v. 45, June 1957, p. 608-613.

A new continuous heat treating process economically raises mechanical properties of ordinary hot rolled tubular products to meet expanding market for tubular materials of superior strength. (To be continued.) 10 ref. (J26n, J29; ST, 4-10)

181-J. Quench and Temper Process for the Manufacture of High Strength Tubular Products. Pt. 2. H. B. Emerick. *Blast Furnace and Steel Plant,* v. 45, July 1957, p. 721-726, 738.

Continuous quench and temper line for production of high-strength oil well casing and possible other tubular products. 10 ref.
(J26, J29, 1-11; 4-10)

182-J. Steam Atmosphere Heat Treatment. *Canadian Metalworking,* v. 20, June 1957, p. 50-52.

Typical applications in both ferrous and nonferrous field; advantages in improved wear, longer life, better machinability and greater corrosion resistance. (J2k; RM-g32)

183-J. Heat Treatment of Vehicle Transmission Gears. *Engineering,* v. 183, May 17, 1957, p. 619-620.

Specially designed heat treatment equipment capable of processing 1000 lb. of commercial vehicle transmission gears every 7 hr.
(J general, 1-2, T7a)

184-J. Metallurgical Aspects of Induction Heating. Pt. 1. Harry B. Osborn, Jr. *Industrial Heating,* v. 24, June 1957, p. 1102-1116, 1254.

Theoretical principles. Relationships of factors influencing surface hardness of SAE 1045, or similar steels following heating by induction and spray quenching. Variables include frequency power density, prior structure of steel, diameter of steel, heating time, time between heating and quenching. (To be continued.) (J2g; ST)

185-J. Metallurgical Aspects in the Design and Operation of a Continuous Annealing Line. Pt. 2. A. F. Mohri. *Industrial Heating,* v. 24, June 1957, p. 1168-1178.

Data on effective soaking time, cooling time, annealing temperature, quenching temperature for annealing cycle of low-carbon steel strip to be

used as tinplate; effect on hardness of steel strip of constituents that form a substitutional or interstitial solid solution. (To be continued.) (J23, 1-2, 1-11; CN, 4-3)

186-J. Heat Treating Facilities Expanded by California Doran Heat Treating Co. W. G. Thompson. *Industrial Heating,* v. 24, June 1957, p. 1264-1276.

Gas-fired radiant tube 3-zone pit loading tower furnace for heat treating work up to 15 ft. long and 48 in. in diameter, using automatically controlled endothermic generator gas atmosphere. Other units for controlled atmosphere heat treatment such as gas carburizing, dry cyaniding, carbonitriding and bright hardening. (J2k, W27g, 1-2)

187-J. Steam Treat Tools for Longer Shop Life. F. L. Spangler and M. E. Lackey. *Iron Age,* v. 179, June 27, 1957, p. 106-108.

Test results showing performance of machine tools, circular slotting saws and drills with regular surface finish or with oxide film formed by heat treatment in steam atmosphere. Hard porous oxide film from steam treatment gave improved performance. (J2k, T6n; Ts, RM-g32)

188-J. Continuous Normalizing and Heat Treating Equipment for Steel Plate. Horace Drever and N. K. Willis. *Iron and Steel Engineer,* v. 34, June 1957, p. 125-130.

Fully automatic continuous plate heat treating line includes charging transfer car, 145-ft. hardening furnace, pressure quench, quench transfer car, 200-ft. tempering furnace, conveyer tables, transfer cars, plate layout and test block cutting tables. The line is capable of handling plate up to 172 in. wide, 3/16 to 3 in. thick and 480 in. long if quenched, and 575 in. long if normalized and air cooled.
(J24, J26, 1-2, 1-11; ST, 4-3)

189-J. Metallurgical Aspects in the Design and Operation of a New Continuous Annealing Line. A. F. Mohri. *Proceedings of the 64th General Meeting of the Iron and Steel Institute,* 1956, p. 123-149.

Hardness values are followed on low-carbon steel strip to determine relationship of temperature and time to hardness. Recrystallization temperature, effect of soaking time, maximum quenching temperature, effect of cooling time and effect of carbon, nitrogen, phosphorus, tin and molybdenum on hardness are determined and discussed and their contribution to the annealing cycle considered. 8 ref.
(J23, 1-11, Q29n; CN, 4-3)

190-J. Vacuum Heat Treating Takes Hold. R. R. Giler. *Steel,* v. 141, July 15, 1957, p. 108-110.

Design and applications of a vacuum furnace for semicontinuous annealing at high temperatures.
(J23, 1-2, 1-23)

191-J. New Methods of Heat Treatment and Surface Impregnation of Metals in Fused Salts. A. I. Zot'ev. *Vestnik Mashinostroeniya,* v. 35, 1955, p. 67-71. (*Henry Brutcher Translation* no. 3955).

Previously abstracted from original. See item 135-J, 1956. (J2, ST)

192-J. (German.) **Nitriding and Related Problems With Regard to Materials Used.** K. Bielau. *Fertigungstechnik,* v. 7, Mar. 1957, p. 103-111.

Temperatures and rate of absorption; alloying additions; surface hardening; nitriding methods; physical properties and increase in performance of nitrided steel. 22 ref. (J28k; ST)

193-J. (German.) **Case Hardening by Gas Carburizing.** W. Stuhlmann. *Fertigungstechnik,* v. 7, Apr. 1957, p. 153-160.

Preparation of the carburizing gas, its composition and influence on the carburizing results; the furnace installation and proper heat treatment of the material to be hardened; carbonitriding. (J28g, J28m, 1-2)

194-J. (German.) **Quench Hardening and Its Application to Toolsteel.** F. A. Treml. *Fertigungstechnik,* v. 7, May 1957, p. 194-202.

A description of the process with charts and tables. Advantages lie in absence of risks in hardening, easier workability of the steel, and increase in toughness and performance. (J26; TS)

195-J. (German.) **Limits of Oil and Water Quenching.** G. Pahl. *Fertigungstechnik,* v. 7, May 1957, p. 203-208.

Chemical composition of steels and their influence on depth of the hardening zone; cooling requirements; critical cooling speed; curves for water, oil and air cooling; time-temperature - transformation diagrams. 7 ref. (J28, N8g, W28p)

196-J. (German.) **Errors in Heat Treatment of Steels.** W. Küntscher and K. Werner. *Fertigungstechnik,* v. 7, May 1957, p. 209-212.

Errors in soft annealing in patenting, and in normalizing in specialized heat treatment processes.
(J23, J24, J25)

197-J. (German.) **Induction Heating and Possibilities for Automation in the Hardening Process.** G. Hoffmann. *Fertigungstechnik,* v. 7, May 1957, p. 213-218.

A detailed description of medium-frequency heating (500 to 50 kc.), including calculations, illustrations, diagrams for the process and equipment used. (J2g, 1-2, 18-24)

198-J. (German.) **Experience in Operating an Automatic Induction Hardening Machine for Ball Bearing Rings.** A. Naumann. *Fertigungstechnik,* v. 7, May 1957, p. 218-221.

Description and evaluation of machine and explanation of process. (J2g, 1-2, T7d; ST)

199-J. (German.) **Usefulness and Limits of Induction Hardening. Pt. 1.** W. Barth. *Fertigungstechnik,* v. 7, June 1957, p. 251-257.

Induction hardening of steel; characteristics of the process (surface hardening, endurance limits); physical basis (induction heating, surface effect, depth involvement); material problems (carbon contents, normalizing, quality of raw materials, steel "C45"). (J2g; ST)

200-J. (German.) **Induction Surface Hardening of Cast Iron for Surface Guides in the Machine Tool Industry.** G. Benkowsky. *Fertigungstechnik,* v. 7, June 1957, p. 257-259.

Process used at the Hermann Schlimme plant, Berlin. Preheating, heating loop, material problems, depth of hardening, surface hardening; hardening temperatures, structure, distortion due to hardening and polishing after hardening.
(J2g, W25c, 17-7; CI)

201-J. (German.) **Heat Treatment of Roller Bearing Rings With Consideration of Resulting Distortion.** M. Smahel. *Fertigungstechnik,* v. 7, June 1957, p. 265-271.

Influence of size of the rings on the choice of heat treatment; choice of raw material and annealing process; influence of inner tensions after treating; influence of repeated hardening on distortion.
(J general, T7d; 9-24)

202-J. (German.) **Flame Hardening, a Means for Increasing Production Efficiency.** Jörgen Püschel. *Schweissen und Schneiden,* v. 9, June 1957, p. 279-280.

Considerable savings in weight can be obtained by increasing the permissible flank pressure for gear teeth from 30 to 60 kg. per sq. mm. Through the use of electronic operation and program control very high precision work by flame hardening machines is made possible. In the manufacture of compact wheels with small pitch the rotational gear hardening process has been successful. In this process, which is extremely economical, the wheel is externally heated and quenched in oil. (J2h, T7a)

203-J. (Polish.) **Production and Application of Controlled Furnace Atmosphere of Endothermic Type.** Jozef Goczal. *Hutnik,* v. 24, Mar. 1957, p. 92-99.

Types of furnace atmospheres and their application; plants for endothermic-type atmosphere production; methods of atmosphere composition adjustment and calculation; example of atmosphere selection for chromium steel heat treatment; conformity of the results with computations. 3 ref.
(J2k, W28q, 1-2; AY)

204-J. Nondestructive Determination and Control of Shallow Carburized Case Depths. Romeo Suffredini. *ASTM Bulletin,* no. 223, July 1957, p. 74-78.

Data on correlation of liquid-carburized case depth in AISI C1010, B1112 and C1120 steels with Rockwell superficial hardness values.
(J28, Q29a; CN)

205-J. Determination of Hardening Properties in Unalloyed and Lightly Alloyed Steels. Erich Greulich. *Draht (English Edition),* no. 28, Apr. 1957, p. 11-14.

Number representing natural logarithm of shortest half-time period of isothermal, austenitic, conversion phase used to determine hardening properties of carbon and low-alloy steels; advantages of method compared to face quenching test.
(J5, 1-4; CN, AY)

206-J. Prepared Furnace Atmospheres for Heat Treating. E. J. Funk, Jr. *Industrial Gas,* June 1957, p. 14, 20.

Types of atmospheres commercially available and typical applications.
(J2k; RM-g)

207-J. Metallurgical Aspects of Induction Heating. Pt. 2. Harry B. Osborn, Jr. *Industrial Heating,* v. 24, July 1957, p. 1350-1362.

Description and illustrations of relationship in controllable variables such as frequency, depth of hardness, power density and structure. (J2g)

208-J. Metallurgical Aspects in the Design and Operation of a Continuous Annealing Line. Pt. 3. A. F. Mohri. *Industrial Heating,* v. 24, July 1957, p. 1370-1378.

Influence of composition on hardness. Equation representing combined effect of Rockwell hardness value, effective soak time, maximum soaking temperature, effective cooling time, carbon content and phosphorus content. 7 ref. (J23, 1-11)

209-J. Strengthen Powdered Iron Parts With Steam. F. L. Spangler and M. E. Lackey. *Iron Age,* v. 180, Aug. 1, 1957, p. 98-99.

Heat treating parts in a superheated steam atmosphere increases hardness and compressive strength. Wear and corrosion resistance are also increased. (J general; Fe, 6-22)

210-J. Position of the Cold Shortness Threshold in Temper Embrittlement. V. I. Prosvirin and E. I. Kvashnina. *Metallovedenie i Obrabotka Metallov,* no. 3, Mar. 1955, p. 17-20. (*Henry Brutcher Translation* no. 3911.)

Previously abstracted from original. See item 45J, 1956.
(J23, Q26s; AY)

211-J. Sintin, a New and Efficient Agent for Gas Carburizing. A. T. Kalinin, M. N. Kunyavskii and A. Ya. Zaitseva. *Metallovedenie i Obrabotka Metallov,* no. 11, Nov. 1956, p. 40-49. (*Henry Brutcher Translation* no. 3975.)

Shortcomings of the customary gas carburizing agents; relationship between amount of soot and coke formed in furnace and the carburizing time. Tests for susceptibility of the various agents to sooting and coking; suitability of paraffins compared to olefins, naphthenes and aromatics as constituents of gas carburizers; their relative efficiencies; advantages of use of various fractions of Sintin, a low aromatic, high paraffin Fischer-Tropsch oil free from sulphur.
(J26g; ST, RM-g)

212-J. (French.) **Selection and Heat Treatment of Gear Steels.** (Concluded.) O. Pattermann. *Métallurgie et la Construction Mécanique,* v. 89, July 1957, p. 643-652.

Tempering after case hardening; annealing; examples of heat treatment of gears as practiced in the United States. 44 ref.
(J general, T7a; ST)

213-J. Surface Hardening of Titanium With Metalloid Elements. A. Siede and V. Pulsifier. Watertown Arsenal Laboratory, Report 401/84-55. *U. S. Office of Technical Services,* PB 131103, May 1955, 99 p. (CMA)

Titanium with nitrided surfaces has great wear resistance and hardness, but case depth is too small for many uses. Case depth is increased when oxygen is used with nitrogen, but the brittleness of the case is also increased. The processes described provide hard, wear resistant and antigalling surfaces to titanium and its alloys. (J28k; Ti)

214-J. (French.) **Case Hardening. Hardening of Steels After Case Hardening.** G. de Smet. *Pratique des Industries Mechaniques,* v. 43, Apr. 1957, p. 91-96.

Structure of steel immediately after case hardening treatment; cooling after case hardening; homogenization; regeneration; quenching, direct, single, double; treatment of case hardening alloy steels; tempering of quenched case hardening steels. (To be continued.)
(J28, J29; ST)

215-J. (French.) **Case Hardening by Oxy-Acetylene Torch.** Marcel Vilez. *Revue de la Soudure,* v. 13, no. 2, 1957, p. 67-77.

Techniques, variable, types of steel and cast iron to which this treatment can be applied, equipment and characteristics imparted.
(J2h, 1-2; ST, CI)

216-J. (German.) **Investigation Into the Normalizing Heat Treatment of Constructional Steels by Single or Repeated Impulse Heating.** K. Wellinger and P. Rupp. *Schweissen und Schneiden,* v. 9, July 1957, p. 339-349.

Normalizing in the welding machine; selection of suitable conditions; effect of repeated heating; comparison of results. 11 ref.
(J24, K general; ST, SGB-s)

217-J. (Japanese.) **Gas Annealing of Blackheart Malleable Cast Iron.** *Casting Institute of Japan, Journal,* v. 29, Apr. 1957, p. 217-218.

Effect of varying carbon monoxide and carbon dioxide ratio in the annealing furnace.
(J23b, W27g, 1-2; CI-s)

218-J. (Russian.) **On Minimizing Brittleness of Nitrided Layer of 38XMYA Steel.** A. A. Yurgenson and T. M. Pogretbetskaya. *Metallovedenie i Obrabotka Metallov,* no. 4, Apr. 1957, p. 41-44.

Influence of preliminary heat treatment on the nitrided layer; quenching in water at 930° C. results in improved mechanical properties, achieved at a lower cost than with oil quenching. The sharp lowering of brittleness of nitrided layer in samples which were heated above 1000° C. is explained by the grawth in grain size and development of nitride network. (J28k, Q26s; ST)

219-J. (Russian.) **Survey of Technology of Steel Heat Treatment.** A. D. Assonov. *Vestnik Mashinostroenia,* v. 37, Jan. 1957, p. 58-64.

Survey of early and current practice in Soviet steel heat treating shops. Case hardening, surface hardening by induction and heat infrared heat, and heat treatment in controlled atmosphere. Improved heat treatment methods enable replacement of high-alloy steel by low-alloy fine-grained steel in manufacture of automobile parts. (J general; ST)

220-J. (Russian.) **Application of Induction Heating in Production of Automobile Springs.** V. N. Bogdanov. *Vestnik Mashinostroenia,* v. 37, Jan. 1957, p. 64-67.

Application of induction heating simplifies production of springs, especially bending and tempering. Details of experimental heat treatment. Two semi-automatic machines utilizing induction heating principle for spring bending, tempering and forming are described.
(J2g, 1-2, T7c; ST)

221-J. (Russian.) **Increase of Wearing Qualities of Pneumatic Hammer Socket Pipes.** I. I. Lutomski. *Vestnik Mashinostroenia,* v. 37, Feb. 1957, p. 62-64.

The socket usually lasts one year unless it is heat treated. The most convenient way of heat treatment is nitriding. Detailed description of the process. The nitrogen hardened layer is 0.35-0.50 mm. thick; its impact resistance is approximately twice the value for an untreated surface. (J28k, Q9n; ST)

222-J. (Russian.) **Surface Hardening of Crank Pins With Gas-Oxygen Flame at High Rotating Speed.** M. L. Kazakov. *Vestnik Mashinostroenia,* v. 37, Feb. 1957, p. 67-70.

Process and plant for reconditioning tractor crankshafts using gas-oxygen flame. Any lathe of 30-100 RPM can be adapted. The process can be easily utilized by small workshops. (J2h, 1-2; ST)

223-J. (Russian.) **New Methods of Gas Heating.** B. F. Kopytov. *Vestnik Mashinostroenia,* v. 37, Mar. 1957, p. 53-57.

Heat treatment of parts by induction heating is too expensive. Local gas heating and infrared heating methods are recommended. Diagrams of the gas-air mixer and various burners as applied in local gas heating. (J2, W27q, 1-2)

224-J. Quench and Temper Process for the Manufacture of High Strength Tubular Products. H. B. Emerick. *Iron and Steel Engineer,* v. 34, July 1957, p. 124-130.

Process of continuous heating, water spray quenching and tempering is effective in producing high-strength tubular steel products needed for deep high-pressure oil and gas wells; mechanical properties for high-strength steels following quench and temper processes. (J26, J29, Q general; ST, SGB-a, 4-10)

225-J. Annealing of Zinc Base Die Castings. W. B. Stephenson, Jr. *Metal Treating,* v. 8, July-Aug. 1957, p. 6, 44, 45.

Experience in using heat treatment of 1 hr. at 410° F. to alleviate difficulties in electroplating due to presence of cold shot defects on casting surface. Treatment reduced hand buffing required after nickel plating and increased salt spray resistance of plated castings.
(J23; L17; Zn, *Ni*, 5-11)

226-J. Practical Heat Treatment for Titanium Alloys. P. D. Frost. *Metal Treatment and Drop Forging,* v. 24, Aug. 1957, p. 307-312. (CMA)

Possibilities and problems of heat treating titanium and its alloys, based on the dependence of response to heat treatment on beta formers, the dependence of hardening on the solution, prevention of ductility loss by working and heating below the beta transus, and dependence of beta-phase stability on holding the last heat treatment between 800 and 1150° C. Beta stabilizers are only slightly soluble in alpha-titanium. 10 ref. (J general, N6p; Ti)

227-J. Versatile, Tailor-Made Heat-Treating. K. E. Henrikson. *Plant Engineering,* v. 11, Aug. 1957, p. 116-119.

Organization of a heat treat department; description of equipment. (J general, 1-2)

228-J. **Modernized Heat-Treating Facility Pays Off.** *Tool Engineer,* v. 39, Sept. 1957, p. 103-104.

New carburizing and marquenching of truck gears, kingpins and shafts reduce heat treating stresses. (J28g, J26p)

229-J. **Thermal Annealing of Imperfections in the Noble Metals.** J. S. Koehler, J. W. Henderson and J. H. Bredt. Paper from "Creep and Recovery", American Society for Metals, p. 1-13.

Survey of annealing data and association of each annealing drop with some atomic process. Four types of treatment which produce imperfections which can be annealed are considered. 36 ref. (J23, M26s, EG-c)

230-J **Mechanism of Annealing in Neutron Irradiated Metals.** T. H. Blewitt, R. R. Coltman, D. K. Holmes and T. S. Noggle. Paper from "Creep and Recovery", American Society for Metals, p. 84-110.

Evaluation of various interpretations of annealing spectrum which arises as a result of low-temperature irradiation. 31 ref. (J23, 2-17)

231-J. (French.) **Influence of Austenitizing Temperature on Mechanical Characteristics and Hardenability of a Low-Alloy Cr-V Steel.** F. Maratray and G. Delbart. *Institut de Recherches de la Sidérurgie, Publications,* Ser. A, no. 152, Feb. 1957, p. 1-15. (Reprinted from *Revue de Metallurgie,* v. 53, Nov. 1956, p. 884-896.)

Experiments were conducted on samples of a 40-CV-4 type Cr-V steel produced in a high-frequency acid-bottom induction furnace. Austenization temperatures were scaled every 25° between 825 and 975° C. Jominy hardenability, hardness and microstructure after oil quenching reported. Discussion of mechanical characteristics after oil quenching and tempering includes: influence of duration of tempering operation on hardness and strength; study of indexes of quality after heat treatment; comparison of mechanical characteristics resulting from various austenitizing temperatures. 3 ref. (J22, J5, Q general, AY, *Cr, V*)

232-J. (French.) **Stepped-Frequency Induction Heating of Electromagnetic Parts.** J. Minssieux. *Revue Générale de l'Electricité,* v. 66, May 1957, p. 239-245.

Highly satisfactory treatment of steel bars is accomplished by initial heating to 700° C. with alternating currents of 50 hertz industrial frequency (exact frequency depending on size of bars), and completion of heating to 1250° C. with alternating currents at frequencies of about 1000 hertz. (J2g; ST, 4-5)

233-J. (German.) **Effect of a Final Annealing in High Vacuum on the Magnetic Reversal Loss of Hot and Cold Rolled Transformer Sheet.** Franz Lihl. *Archiv für das Eisenhüttenwesen,* v. 28, Apr. 1957, p. 223-228.

Magnetic, metallographic and radiographic tests on warm and cold rolled transformer sheet containing 4.3% silicon and 0.25% aluminum, after annealing in a high vacuum, indicate a reduction of magnetic reversal loss as compared to annealing in protective gases. 7 ref. (J23, 1-23, P16; Fe, 4-3)

234-J. (Japanese.) **Change of Properties of Steel Caused by Low-Temperature Quenching. 4th Rept. Improvement of Notch Fatigue Strength.** Tadakazu Sakurai, Tadashi Kawasaki and Yukizumi Kita. *Japan Society of Mechanical Engineers, Transactions,* v. 23, July 1957, p. 489-494.

The effectiveness of low-temperature quenching in increasing fatigue strength and impact strength of steel. 21 ref. (J26, 2-13, Q7a, Q6n; ST)

235-J. (Spanish.) **Age Hardening of Brasses Containing Zirconium or Titanium.** Sebastian Feliu Matas. *Instituto del Hierro y del Acero,* v. 10, Apr-June 1957, p. 160-165.

Study of behavior of four ternary copper-zinc base brasses (approx. 70% Cu, 30% Zn) when subjected to different aging treatments. Brass containing 0.56% Zr does not age harden. Brasses with additions of Ti harden under appropriate treatment. Brass containing 1.35% Ti shows hardness increase of 50% after aging 24 hr. at temperatures of 350 to 450° C. 7 ref. (J27d; Cu-n, *Zr, Ti*)

236-J. (Spanish.) **Surface Hardening by High-Frequency Induction Heating. Physical Principles and Metallurgical Factors.** Miguel P. de Andrés. *Insti-*

tuto del Hierro y del Acero, v. 10, Apr-June 1957, p. 200-210.

Depth of penetration, importance of frequency selected on desired characteristics; thermal effects in a piece of steel treated by high-frequency induction heating and reasons justifying use of this method; basic metallurgical factors in surface hardening process and their influence on mechanical properties of steel; technical and economic advantages of process. 11 ref. (J2g; ST)

237-J. (Book—French.) **Heat Treatment as Practiced in the Metal Industries.** Gerald de Smet. 1957. 466 p. 5th Ed. Dunod, 92 Rue Bonaparte, Paris 6ᵉ, France. 3,300 Fr.

Subjects discussed include: iron smelting and steel manufacture; influence of alloying additions; classification of iron and steel; types of heat treatment such as annealing, normalizing, quench hardening, case hardening, nitriding, tempering; industrial applications; pyrometry; furnaces, nonferrous metals such as aluminum and light alloys; mechanical and physical tests. (J general)

238-J. (Book—French.) **Heat Treatment of Construction Steels.** Andre Sourdillon. 363 p. 1957. 2nd Ed. Editions de la Revue d'Optique, Paris.

Comprehensive coverage of constitution, structure, properties of common and alloy construction steels and effects of annealing, hardening treatments, tempering, cementation, etc.; execution of heat treatments; control of treated material. For those with prior knowledge of subject. (J general; ST, SGB-s)

239-J. Continuous Strip Annealing Line Has Precise Temperature Control. *Blast Furnace and Steel Plant,* v. 45, Sept. 1957, p. 1024-1025.

Control system at the Steel Co. of Canada Ltd. uses a radiation pyrometer to rapidly detect the effect of load changes and reset individual zone controllers, thereby permitting temperature control within normal tolerances on a completely automatic basis. (J32, X9r, 1-2; ST, 4-3)

240-J. Salt-Bath Graphitization Applied to High-Sulphur Irons. Olivier Bader and Daniel Godot. *Foundry Trade Journal,* v. 103, Aug. 15, 1957, p. 195-197.

Experiments demonstrate advantages of using salt bath at 1050° C for graphitization followed by heating at 740° C. in controlled atmosphere oil-fired furnace for partial ferritization of high sulphur, white cast iron; graphitization and ferritization processes control tensile strength and elongation properties of iron. (J23b, J2j; CI-p)

241-J. Bright Heat Treating the Nonferrous Alloys. Clarence E. Peck. *Metal Progress,* v. 72, Sept. 1957, p. 70-75.

Atmospheres are specified for successful bright annealing of the principal nonferrous metals and their alloys, to avoid dezincification of brasses, and to protect properly powder metal compacts during sintering, or combination during furnace brazing. (J2k, J23a, H15q, K8; Eg-a38).

242-J. Relief of Residual Grinding Stresses by Annealing. H. R. Letner and A. B. Sauvageot. *Metal Progress,* v. 72, Sept. 1957, p. 79-82.

Momentary heating of the surface (no more than 90 sec, in a salt bath) at 650° F. will relieve 80% of the internal stresses left by grinding. If softening of more than 1 point on the Rockwell scale is prohibited, 90 sec. at 500 to 600° F. will remove about half the surface stresses. (J1a, G18; TS)

243-J. Sulphidizing in Fused Salts. E. M. Morozova and F. R. Florensova. *Metal Progress,* v. 72, Sept. 1957, p. 182-184. (From *Stanki i Instrument,* v. 29, no. 5, 1956.) (Complete translation of original available as *Henry Brutcher Translation* no. 3839.)

Effect of the sulphidizing environment; penetration of the case; results of wear tests. (J2j; ST, *S*)

244-J Some Problems Involved in the Production of Aluminum Sheet in Intermediate Tempers. T. R. G. Williams and T. I. Jones. *Sheet Metal Industries,* v. 34, Sept. 1957, p. 643-648, 668.

Intermediate grades of strength between fully annealed and hard rolled sheet are designated ¼H, ½H and ¾H respectively. Two methods of producing intermediate tempers in alloys of the work hardening type are described. Temper rolling and temper annealing and a comparison between the two processes. (J23; Al, 4-3)

245-J. Austempering Is Mechanized. R. S. McFall and C. A. McFadden. *Steel,* v. 141, Sept. 23, 1957, p. 125-156.

Automatic machine at IBM, heats, quenches, washes and dries typewriter parts automatically. (J26p; ST)

246-J. Ductile Iron: How Heat Treatment Upgrades. R. S. Zeno and C. D. Walker. *Steel,* v. 141, Sept. 16, 1957, p. 132-134.

Heat treatment if it is maintained may be able to save heats of 90-65-02 and 80-60-05 ductile iron which do not meet specifications as cast. Tensile and hardness properties of treated castings are tested. (J general; CI-r)

247-J. Methods of Controlling Atmospheres in Furnaces. O. E. Cullen. *Steel Processing and Conversion,* v. 43, Aug. 1957, p. 458-461, 470-471.

Basic problems of furnace atmosphere control; correct sampling technique and maintenance of proper carbon potential, dew point or gas analysis for heat treating processes such as hardening, carburizing or carbon restoring in both batch and continuous type furnaces. (J2k, X7g, 1-2)

248-J. Heat Treatment of Precipitation-Hardening Stainless Steels for Honeycomb Structures. Allen C. Gilbraith. *Tooling and Production,* v. 23, Sept. 1957, p. 73-80.

Heat treatment procedures for and structural changes occurring in annealing and precipitation hardening of Armco's 17-7 PH, 17-4 PH and Allegheny Ludlum's AM-350 stainless steels developed for use at ultra-thin gages in honeycomb structures for aircraft and missiles; data on physical and mechanical properties at room and elevated temperatures in different heat treated conditions. J23, J27; SS, 7-9)

249-J. Aging Characteristics of Hastelloy B. R. E. Clausing, P. Patriarca and W. D. Manly. Oak Ridge National Laboratory. *U. S. Atomic Energy Commission,* ORNL-2314, Aug. 12, 1957, 7 p.

Aging studies were made by measuring the increase in hardness of Hastelloy B as a function of time and temperature and by observing metallographically any structural changes which occurred. As a measure of the mechanical properties, tensile tests were made at both room temperature and elevated temperatures on the material after various aging treatments. (J27d, N7a; Ni)

250-J. (French.) **O.N.E.R.A. Process of Skin Annealing in a Gaseous Medium. Application to Bright Annealing of Steels and Refractory Alloys.** Ph. Galmiche. *Recherche Aeronautique,* no. 59, July-Aug. 1957, p. 27-32.

Description of process; results in terms of surface condition and structure of surface zones; behavior of treated metals in high-temperature combustion gases; mechanical and service tests. Oxidation problems hitherto encountered in heat treatment of refractory alloys and such steel items as gas turbine blades can frequently be eliminated by introduction of metal fluorides into atmosphere of heat treat container. 5 ref. (J23, J2k; ST, SGA-h)

251-J. (Japanese.) **Salts for Heat Treatment.** Togohisa Kakugawa. *Metals,* v. 27, Aug. 1957, p. 635-637.

Compositions and temperature ranges of various kinds of salts for heat treatment; salts for quenching, carburizing nitriding and for holding at temperature. (J2j; NM-a33)

252-J. (Spanish.) **Spectrographic Determination of the Hardenability of Steels.** A. Camunas and E. Asensi Alvarez-Arenas. *Real Sociedad Espanola de Fisica y Quimica, Anales, Serie B, Quimica,* v. 53 (B), May 1957, p. 353-360.

New technique reveals influence of transformation of metallic state on relative intensities of spectral lines. Hardenability curves charted for carbon and alloy steels were similar to those obtained by conventional metallographic methods (cross section and Jominy tests). 7 ref. (J5, 1-4; ST)

253-J. X-Ray Study of the Sulphurizing of Steel. Yu. M. Vinogradov and V. D. Zelenova. *Zavodskaya Laboratoriya,* v. 23, no. 6, 1957, p. 697-698. (*Henry Brutcher Translation* no. 4032.)

Comparison of X-ray spectra of surface layers of specimens of 0.45% plain carbon steel sulphurized in nine different baths. Advantages of baths producing pure ferrous sulphide in surface layer as against baths giving a predominantly nitrided surface. (J28, M21f; CN, *S*)

254-J. (French.) **Heat Treatment of High-Quality Cast Irons.** Jean Gonin and Gérard de Smet. *Machine Moderne,* v. 51, Sept. 1957, p. 52-58.

Effect of heat treatment on mechanical, physical and chemical properties; hardening treatments with drastic quenching improve the mechanical properties of the jackets of

diesel engines. Annealing and martempering treatments; classification of special cast irons by heat treatment and by chemical treatment.
(J general; CI)

255-J. Methods of Controlling Atmospheres in Furnaces. O. E. Cullen. *Industrial Heating,* v. 24, Aug. 1957, p. 1510-1522, 1534.

Principles of direct automatic conrol of atmospheres in heat treatment furnaces. Methods and the problems in sampling, measuring and controlling atmospheres by analysis of dew point or carbon dioxide in batch or continuous furnaces.
(J2k)

256-J. Gas-Air Flame Hardening Increases Gear Strength. James P. Bates and C. A. Turner. *Industrial Heating,* v. 24, Aug. 1957, p. 1526-1534.

Hardness pattern and microstructure demonstrate desirable properties achieved by flame hardening and oil quenching of wench gear of C1046 steel. (J2h, T7a, ST)

257-J. Why Not Direct Quench? T. W. Ruffle. *Iron and Steel,* v. 30, Sept. 1957, p. 441-444.

Advantages, disadvantages and uses of direct quenching from carburizing vs. double reheat and quench and single reheat and quench. 3 ref. (J26, J28g; ST)

258-J. Nitriding Process. Case Hardening of Steel and Cast Iron by Nitrogen. R. W. Allott. *Metal Treatment and Drop Forging,* v. 24, Aug. 1957, p. 335-338.

Brief review of development, nature and effect on mechanical properties of nitriding. Steels commonly processed and effect of prior heat treatment and recently developed techniques. (J28k; ST, CI)

259-J. Use of Nitrogen-Hydrogen Atmospheres in Metal Treating. *Industrial Heating,* v. 24, Oct. 1957, p. 2020-2022, 2026.

Gas-producing characteristics of new gas generator and application for nitrogen-hydrogen atmospheres.
(J2k, W28q, 1-2)

260-J. Novel Conveyor System and Cast Alloy Components Enable Single Furnace to Do Three Heat Treating Jobs. E. A. Schoefer. *Industrial Heating,* v. 24, Oct. 1957, p. 2047-2054.

Multiple atmosphere heat treatments successfully achieved in a single, flexible gas-fired furnace.
(J2k, W27g, W12r, 1-2)

261-J. How to Get More for Your Metalworking Dollar. Pt. 12. Heat Treating. *Iron Age,* v. 180, Oct. 24, 1957, p. 207-222.

Reference guide for heat treating steel, cast iron, stainless steel and aluminum.
(J general; ST, CI, SS, Al)

262-J. New Temperability Calculator. Leonard Jaffe and Edward Gordon. *Iron Age,* v. 180, Oct. 24, 1957, p. 227-234.

Charts and scale for computing tempering treatments for desired hardness. (J29, 17-2; ST)

263-J. Precipitation Hardening Stainless Steels. Heat Treatment and New Materials in the U. S. Aircraft Industry. Allen C. Gilbraith. *Metal Treatment and Drop Forging,* v. 24, Oct. 1957, p. 395-399.

New "heat-hardenable" steels in the 300 series exhibit outstanding tensile and yield strengths. Heat treating procedures and an outline of honeycomb structures. (J27; SS)

264-J. Lines Anneal Fast Without Soaking. *Steel,* v. 141, Oct. 14, 1957, p. 124-129.

Continuous line for bright annealing of low-carbon steel strip for tinplate. (J23a, 1-11; CN, 4-3)

265-J. How to Avoid Cracking Die Steels. Pt. 2. *Steel,* v. 141, Oct. 7, 1957, p. 200-202.

Proper heat treatment and selection of steels for dies.
(J general; TS, 9-22)

266-J. Construction and Characteristics of Heat Treating Facilities at the Watertown Arsenal Laboratories. S. Valencia. Watertown Arsenal. *U. S. Office of Technical Services,* PB 131116, Oct. 1955, 29 p. $.75.

The facilities provide for the treatment of ferrous and nonferrous metals in connection with the Laboratories' over-all research and development program. A unique feature is a single, room-length instrument panel board which permits control of each furnace. Heat treating equipment includes one tube-type and several box-type electric furnaces, controlled atmosphere producers, rectangular and cylindrical salt-bath furnaces, an oil-tempering furnace and an air-tempering furnace, an induction heating unit, metal cleaning equipment, a low-temperature freezing unit, a vacuum heat treating furnace, and a controlled oil quenching system.
(J general, 1-2, A9h)

267-J. (German.) **Heat Treatment of Malleable Iron in Swedish Foundries.** Hans Weber. *Gjuteriet,* v. 47, Aug. 1957, p. 166-172.

Survey of raw materials and processes; properties of the heat treated iron. 10 ref. (J23b; CI-s)

268-J. (German.) **Application of Protective Atmospheres in Heat Treatment of Steel.** *Chemische Rundschau,* v. 10, Aug. 1, 1957, (not numbered).

Use of hydrogen, nitrogen, carbon dioxide, carbon monoxide, hydrocarbons and dissociated ammonia in heat treatment of steel; technical application and chemical reactions. (J2k, RM-g)

269-J. (German.) **Hardening of Steel Parts in Automobile and Bulldozer Industry With Induction Heating.** Gluchanow. *Kraftfahrzeugtechnik,* v. 7, Aug. 1957, p. 308-311.

Induction heating procedures in U.S.S.R. in fabrication of crankshafts, cylinder liners, camshafts, differentials and gear wheels. (J2g, T21c; ST)

270-J. (German.) **Hardening and Tempering Steel.** *Technik und Betrieb,* v. 9, Apr. 1957, p. 49-50.

Various methods, technology, results. (J26, J29; ST)

271-J. (German.) **Surface Hardening by Nitriding.** Fritz O. Rabenhorst. *Technik und Betrieb,* v. 9, Apr. 1957, p. 51-55.

Bath nitriding with NS 350 is used as method to increase abrasion wear resistance in alloy steels (Cr, Al, W, Mo and V). Related methods of carbonitriding and nitriding are applied in special cases. (J28k, J28m; AY)

SECTION K

JOINING

1-K. Current Trends in Welding Steel Castings. W. H. Rice. *Foundry,* v. 84, Nov. 1956, p. 120-125.

Advances in welding are rapidly being adopted by the steel foundry industry. These processes include inert-gas and semi-automatic submerged arc welding and metallic arc welding with iron-powder-coated and low-hydrogen types of electrodes. (K1; ST, 5-10)

2-K. Chill-Shunt Tooling in Tungsten Arc Welding. Harlan L. Meredith. *Modern Machine Shop,* v. 29, Nov. 1956, p. 114-117.

Details of chill-shunt theory and its application in tooling for fusion butt welding thin-gage material. (K1, W29)

3-K. Some Nondestructive Testing Methods for Testing Welds. W. J. McGonnagle. *Welding Journal,* v. 35, Nov. 1956, p. 1110-1119.

Sensitivity, advantages, disadvantages and limitations of various methods and techniques of nondestructive testing. (S13; 7-1)

4-K. Multipower Submerged-Arc Welding of Pressure Vessels and Pipe. R. A. Kubli and H. I. Shrubsall. *Welding Journal,* v. 35, Nov. 1956, p. 1128-1135.

Advantages of high welding speeds and high deposition rates make technique attractive where larger amounts of repetitive welding are involved. Scott connection provides simplest apparatus and control system while retaining most advantages of the three-phase method. (K1, W29)

5-K. Development of a Ferritic-Austenitic Weld Joint for Steam Plant Applications. J. T. Tucker, Jr., and F. Eberle. *Welding Journal,* v. 35, Nov. 1956, p. 529s-540s.

Apparent solution to the cracking of ferritic-austenitic welded joints found in certain protective weld features and in the use of the proper type of austenitic electrodes. (K1; ST, 9-22)

6-K. Isothermal Studies on the Weld-Metal Microcracking of Arc Welds in Mild Steel. A. E. Flanigan and Z. P. Saperstein. *Welding Journal,* v. 35, Nov. 1956, p. 541s-556s.

Temperature-dependence of time required to achieve isothermal immunization against weld-metal microcracking and reasonableness of the hydrogen-retained austenite hypothesis. (K9; CN, 9-22)

7-K. New Welding Technique Cuts Failures on Tubular Goods. J. R. Gregath. *World Oil,* v. 143, Nov. 1956, p. 135-139.

Multipass welding and use of low-hydrogen electrode recommended for welding medium-carbon steels without pre or postheating. (K1, CN)

8-K. Some Problems of the Metallurgy of Semi-Automatic Welding of Stainless Steel Using Unfused Siliceous Fluxes. A. I. Akulov. *Henry Brutcher Translation No.* 3794, 8 p. (From *Avtomaticheskaya Svarka,* v. 8, no. 3, 1955, p. 50-54.) Henry Brutcher, Altadena, Calif.

Introduction of ferrosilicon into flux. Results obtained with unfused fluxes in the welding of titanium-stabilized stainless steels. (K1; NM-p, SS)

9-K. (Russian.) **On the Use of Cast Iron for Filler Metal.** A. N. Shashkov. *Svarochnoe Proizvodstvo,* no. 11, Oct. 1956, p. 1-5.

A study of cast irons used as filler metal in welding cast iron. Composition and graphitization as well as microstructure discussed. (K2, M27, N8; CI)

10-K. (Russian.) **Preventing the Formation of Pores and Cracks in Automatic Welding of Aluminum.** V. A.

Savchenkov. *Svarochnoe Proizvodstvo,* no. 11, Oct. 1956, p. 9-13.

Mechanical properties of aluminum welded automatically under flux are found to be equal to those of aluminum welded in an argon atmosphere. Dependence of the formation of pores on the crystallization rate is determined. (K1; Al, 9-18, 9-22)

11-K. (Russian.) **Selecting the Procedure for Spot Welding of Interlaced Rod Structures.** V. N. Volcheko, V. F. Kosyrev and I. E. Evgen'ev. *Svarochnoe Proizvodstvo,* no. 11, Oct. 1956, p. 13-16.

Relationship between the strength of spot-welded rods and the welding procedure. Procedure is unaffected when the angle between the rods varies from 90 to 30°. (K3)

12-K. (Russian.) **Industrial Experience With Welding of Titanium.** F. E. Tret'iakov. *Svarochnoe Proizvodstvo,* no. 11, Oct. 1956, p. 22-27.

Experimental data on the weldability of technical titanium. Arc welding in argon or helium atmosphere, automatic welding under flux and contact welding provide satisfactory welds. Gas and atomic-hydrogen welding cannot be used with titanium. (K1, K3, 18-1; Ti)

13-K. (Russian.) **Methods of Testing Welded Joints in the Reinforcement of Reinforced-Concrete Structures.** A. Ia. Brodskii. *Zavodskaia Laboratoriia,* v. 22, no. 10, Oct. 1956, p. 1220-1224.

Design and use of apparatus for testing strength of welded and unwelded joints of the reinforcing framework. Relation between strength of weld and length of time under current. (K9, Q23; ST)

14-K. Porosity in Nickel Welded by the Argon-Arc Process. D. R. Milner. *British Welding Journal,* v. 3, Nov. 1956, p. 542-545.

Argon gave adequate protection of the upper surface of the weld, but oxygen pick-up occurred at the underside. Hydrogen introduced with the argon resulted in elimination of porosity. (K1d, 9-18; Ni)

15-K. Constant Arc Length vs. Constant Arc Voltage. Roger W. Tuthill. *Industry & Welding,* v. 29, Dec. 1956, p. 54-56, 59, 86.

Arc length controls quality and appearance of weld. Arc voltage is convenient tool for measuring arc length. (K1)

16-K. Use Multiple-Pass Welding Techniques to Join Nickel Alloy Components. *Industry & Welding,* v. 29, Dec. 1956, p. 78-80, 82-83.

Inert-gas-shielded arc welding with small-diameter welding rod and multiple passes produces extremely sound and highly uniform welds required for Atomic Energy machinery components. (K1d; Ni)

17-K. Titanium Alloys Arc-Welded in Open Air. Ben C. Brosheer. *Metalworking Production,* v. 100, Nov. 9, 1956, p. 1819-1822.

Fusion welding of titanium alloys in the open air is practical and economical with automatc inert-gas shielded tungsten arc. Manual welding with the same arc also looks promising, but requires a very high level of "operator integrity". (K1d; Ti)

18-K. Take Six Steps to Better Brazing. *Iron Age,* v. 178, Nov. 29, 1956, p. 80-81.

Joint clearance limits brazing alloy flow, flux brushes on more quickly, spreads more uniformly and produces better fluxing action if warmed to about 90 to 100° F.: the brazing alloy flows best if joint is uniformly heated. (K8; SG-f, Ag)

19-K. (Russian.) **Welding of Austenitic Steel Rotors.** K. V. Liubavskii and V. A. Toropov. *Metallovedenie i Obrabotka Metallov,* no. 10, Oct. 1956, p. 52-56.

A study of the conditions of arc welding of rotors consisting of a few disks and two austenitic steel ends. A process was devised for welding and thermal treatment of commercial rotors. (K1, W11, AY)

20-K. The Removal of Oxide From Aluminum by Brazing Fluxes. M. F. Jordan and D. R. Milner. *Institute of Metals, Journal,* v. 85, Oct. 1956, p. 33-40 + 1 plate.

Studies carried out by the interference-fringe technique confirmed that the oxide films are not dissolved, but are detached from the surface by the flux. The film is undermined as a result of electrochemical action at the oxide-metal interface, a cell being set up between the oxide and metal. (K8; Al, NM-p)

21-K. (Czech.) **The Theory of Pressure Welding.** F. Erdmann-Jesnitzer. *Zvaranie,* v. 5, no. 8-9, Sept. 1956, p. 228-233.

The development of a theory of pressure welding which takes into consideration the most important factors of heat, time, pressure and elastic and plastic deformation. Theory agrees well with practice. (K2k, 10-1)

22-K. (Czech.) **Welding With Completely Coated, Completely Consumed**

Electrodes. Vilém Hromadko. *Zvaranie,* v. 5, no. 8-9, Sept. 1956, p. 236-243.

Welding with completely coated electrodes of the type E44.72. The electrodes are lightly welded to the holder and are completely consumed. Advantages and disadvantages. (K1a, W29)

23-K. (Book.) **Observations on Weak Laps in Tinplate Can Bodies.** W. E. Hoare and J. P. Gustin. 12 p. 1954. Tin Research Institute, Fraser Road, Perivale, Greenford, Middlesex, England.

Satisfactory seam strength depends ultimately on design of the seam, control of can-fabricating operations so that designed dimensions are maintained, use of proper conditions in soldering, and use of tinplate of good soldering quality. (K7, 18-17; Sn)

24-K. (Book.) **The Weldability of High-Tensile Structural Steels.** C. L. M. Cottrell, K. Winterton, and B. J. Bradstreet. 102 p. 1956. Reprint of Ministry of Supply Report; W. R. (D) Jan. 1955, British Welding Research Association, London, England.

Concerns the problem of cold cracking in the heat affected zone of welds made in low-alloy structural steels. (K9n, 18-1; AY)

25-K. **Automatic Welding Speeds Fabrication of Lake Vessel Sub-Assemblies.** *Industry and Welding,* v. 30, Jan. 1957, p. 52-54, 64.

Automatic welding saved 20% in welding time on hull and housing of freighter "George M. Humphrey". (K1, T22)

26-K. **Redesign for Projection Welding Yields First Space Saving Rectangular Motor.** *Industry and Welding,* v. 30, Jan. 1957, p. 58-63.

New small accessory motor of rectangular shape made possible by projection welding. (K3q)

27-K. **Solder Aluminum to Other Metals.** Kenneth V. Lutz. *Industry and Welding,* v. 30, Jan. 1957, p. 74-79.

New soldering alloys and fluxes make it possible to join aluminum to steel, stainless steel, Monel, nickel, copper and brass. (K7; Al, SGA-n)

28-K. **Welded Umbrella Supports Stadium Shell.** *Iron Age,* v. 178, Dec. 20, 1956, p. 83.

Self-supporting welded steel shell built at Georgia Tech. (K general, T26)

29-K. **Flash Weld Titanium to High Strengths.** *Iron Age,* v. 178, Dec. 27 1956, p. 57.

Procedure for welding titanium similar to that used for steel except a low upset pressure is best. (K3r; Ti)

30-K. **Tips for Ultrasonic Soldering of Aluminum.** Ralph Reynolds. *Light Metal Age,* v. 14, Dec. 1956, p. 16.

Metals suitable for ultrasonic soldering; suggestions for obtaining the best results include cleaning, preheating and lacquering all soldered areas likely to be exposed to adverse weather. (K7; Al)

31-K. **Soldering Keeps Up to Date.** *Steel,* v. 139, Dec. 17, 1956, p. 86-90.

New solders and techniques used in joining materials such as stainless, titanium, molybdenum, aluminum, glass and ceramics; usage of ultrasonic equipment. (K7, W29; SS, Ti, Mo, Al)

32-K. **This Building Is Welded.** *Steel,* v. 139, Dec. 24, 1956, p. 64-65.

Frame for 19-story office building welded with automatic submerged-arc welder. (K1e, T26; ST)

33-K. **Inert-Tungsten-Arc Butt Welding of Zircaloy-2 Tubes.** J. W. Lingafelter. *U. S. Atomic Energy Commission. HW*-43049, Aug. 1, 1956, 23 p. (CMA)

A 52-ft. internally ribbed tube of Zircaloy-2 was butt welded from three smaller sections by the inert-tungsten-arc method, using a copper backup plug. The joints were fully penetrated and contained no significant porosity or contamination. Equipment and welding procedure described. (K1d; Zr, 4-10)

34-K. **Fusarc/CO_2, a New Welding Process.** E. J. Mitchell and W. E. Freeth. *Welding and Metal Fabrication,* v. 24, No. 12, Dec. 1956, p. 431-438.

New development in arc welding in which a continuous covered electrode of special design is deposited under a shield of CO_2. The combined use of flux and gas shielding enables a unique combination of metallurgical and operational properties to be obtained at high welding speeds. (K1)

35-K. **Welding Technology in the U.S.S.R.** *Welding and Metal Fabrication,* v. 24, No. 12, Dec. 1956, p. 439.

Electro-slag method being used by 25 plants for welding heavy plate

and large sections. Automatic metal-arc welding widely used, 40% of welding in U.S.S.R. being automatic. Gamma-ray equipment has largely displaced X-ray equipment in shipyeard inspection work.
(K1, S13e, T-22; 4-3)

36-K. Equipment for Metal Bonding. R. A. Johnson. *Welding and Metal Fabrication,* v. 24, No. 12, p. 447-451.

Types of adhesives and methods for applying heat and pressure.
(K12)

37-K. Time-Temperature Dependence of Austenitic Stainless-Steel Welded Joint Components. J. Heuschkel. *Welding Research,* v. 21, Dec. 1956, p. 569-581.

Relation of "weldability" to ductility, composition, microstructure and its orientation. "Weldability" ideal defined. 22 ref. (K9n, 17-2; SS)

38-K. Metal Finish Seam Welding. W. J. Allen and M. L. Begeman. *Welding Research,* v. 21, Dec. 1956, p. 597s-603s.

Considerable similarity found between schedules for mash seam welding and finish seam welding; with proper conditions a good finish surface can be consistently maintained on one side of sheets. (K3p)

39-K. The Welding of High-Strength Aluminum Alloys in Heavy Sections. Willis G. Groth and Richard A. Matuszeski. *Welding Research,* v. 21, Dec. 1956, p. 616s-622s.

Investigations indicate that 5154 and 5056 aluminum alloys in heavy sections handle satisfactorily and have mechanical property advantages over 6061 alloy for many applications.
(K general, Q general; Al)

40-K. A Dew Point-Temperature Diagram for Metal-Metal Oxide Equilibria in Hydrogen Atmospheres. W. H. Chang. *Welding Research,* v. 21, Dec. 1956, p. 622s-624s.

New diagrams for use as a guide for furnace brazing in hyrogren atmospheres. 6 ref. (K8j, N15a; H)

41-K. Plasticity Committee. Paul Ffield. *Welding Research Council Yearbook,* 1956, p. 18.

A manual on the design and fabrication of large field-welded engineering structures has been prepared and will be available soon.
(K general, T26, 18-17)

42-K. Structural Steel Committee. LaMotte Grover. *Welding Research Council Yearbook,* 1956, p. 27-31.

The following projects are discussed: wedge beam investigation at Columbia University, welded interior beam and column connections at Lehigh University, and transfer of stresses in welded cover plates at University of Florida.
(K general, T26; ST, 17-1)

43-K. Resistance Welding Research Committee. John F. Randall. *Welding Research Council Yearbook,* 1956, p. 34-38.

Investigations underway: series spot welding and flash welding at Rensselaer Polytechnic Institute; seam welding at University of Texas; fatigue of spot welding at Ecole Polytechnique; and contact resistance welding at Johns Hopkins University. (K3, A9)

44-K. Welding Procedures Committee. L. J. Larson. *Welding Research Council Yearbook,* 1956, p. 40-41.

The project on postheat or thermal stress-relieving treatments has been given highest priority. (K9q, J1a)

45-K. High Temperature Braze Process Versatile Tool for Jet Engine Metals. John V. Long, George D. Cremer and Richard S. Mueller. *Western Metals,* v. 14, Dec. 1956, p. 58-61.

Applications of brazed assemblies in compressor, combustor, turbine and after-burner areas of jets.
(K8, T24b; SGA-h)

46-K. (Japanese.) **Welding Agents for High Speed Steel.** Hidetsugu Tada. *Metals,* v. 26, Dec. 1956, p. 966-968.

Methods of welding using welding agents; experimental results.
(K general; TS)

47-K. Butt-Weld Tooling for Thin Gauge Aluminum. Gilbert C. Close. *Light Metal Age,* v. 14, Dec. 1956, p. 17-18.

Deals with the "chill-shunting theory" used in butt-welding thin-gage aluminum, and the weld tooling that makes application of this theory possible. (K1d, W29; Al)

48-K. Semi-Automatic Welding Cuts Production Costs. Charles F. Ayers. *Pacific Factory,* v. 86, Dec. 1956, p. 22-23.

Versatility has been achieved by turning jigs for the position of the work, and hand-held "dams" for the containment of the hot-flowing flux.
(K1e, W29)

49-K. Joinings and Assembly Forum on Technical Progress. *Steel,* v. 140, Jan. 7, 1957, p. 386-394.

Short contributions by 22 executives in the industry on recent trends. A few of these are the trend in fasteners to closer tolerances and higher strengths, growing usage of silver alloy brazing, welding becomes more mechanized for greater productivity and metal bonding adhesive finds increasing acceptance. (K general)

50-K. (Russian.) **Automatic Electric Arc Welding of Titanium.** S. M. Gurevich, C. V. Mishehenko and Ye. O. Paten. *Avtomaticheskaya Svarka,* No. 5, Sept.-Oct. 1956, p. 1-12.

Technology of electric-arc welding of titanium with nonconsumable electrode in an inert-gas stream; characteristics of automatic welding of titanium under flux; data on the structure and mechanical properties of weld seams. (K1d; Ti)

51-K. (Pamphlet—Russian.) **Soldering of Aluminum and Its Alloys With the Use of Ultrasonic.** G. I. Apukhtin. *Informatsjya O Nauchno-Issledovatel' skikh Robotakh* (Information on Research Works), No. I-56-3, Moscow, 1956.

New method for soldering aluminum and its alloys, with the aid of ultrasonics, in which mechanical cleaning of the surfaces is supplanted by the phenomena of cavitation in the fused solder produced by ultrasonic vibrations in the soldering iron tip. Generation of the vibrations is accomplished by means of magnetostrictional vibrators. Table of special solders, their contents and properties, and schematic drawings of the equipment are included. This method may be adapted to ferrous and nonferrous metals. (K7h; SGA-f)

52-K. Brazed Stainless Sandwich Spotwelded. J. C. Herr, R. C. Smith, G. L. Peterman. *American Machinist,* v. 101, Jan. 14, 1957, p. 127-129.

Welding setup similar to those used for other stainless spot welds used to join brazed, honeycomb panels to supporting members. (K3n; SS, 7-9)

53-K. Weld Procedure. E. Ryalls and F. Warner. *British Welding Journal,* v. 4, Jan. 1957, p. 39.

Welding sequence of commercially pure aluminum by the argon-arc process. (K1d; Al)

54-K. Welding Costs Must Come Down. H. J. Nichols. *Canadian Metals,* v. 20, Jan. 1957, p. 24, 25.

Advantages and disadvantages from cost and application standpoints of manual welding and automatic process; trends, developments. (K general, 17-3)

55-K. How Heat and Time Affect Welding. A. C. Ward. *Iron Age,* v. 179, Jan. 17, 1957, p. 75-77.

Suggests by the use of metallurgical data how to anticipate and compensate for crystalline structure changes that occur as you weld. (K9n)

56-K. Hard-to-Braze Alloys Behave in Vacuum Setup. W. G. Patton. *Iron Age,* v. 179, Jan. 24, 1957, p. 80-82.

Vacuum furnace allows greater use of high-temperature alloys and critical materials, permits brazing of honeycomb tight structures, increases range of bonding alloys and allows vacuum degassing. (K8j, 1-23)

57-K. Symposium on Titanium IV. Practical Problems Associated With the Control of Interstitials I. In Welding and Forming. C. W. Handova. *Journal of Metals,* v. 9, Jan. 1957, p. 178-180. (CMA)

Much research has been accomplished on the effect of interstitials on ductility, impact properties and filler wire in welds of titanium. Most titanium alloys may be welded if the interstitial content is kept low; shielding is desirable. The weld bend ductility test is necessary. Interstitials are detrimental in forming, but hot forming can overcome their strengthening effect. Ease of forming titanium is related to the yield strength, as is springback. Pickle baths are recommended. 19 ref. (K1, G general, 3-19; Ti)

58-K. Welded Aluminium Piping. *Light Metals,* v. 20, Jan. 1957, p. 20-27.

Welding equipment and its operation in a tubemaking plant. (K general, 1-2; Al, 4-10)

59-K. Use of Adhesives for Metal Joining in Germany. A. Matting and E. Rubo. *Metal Progress,* v. 71, Jan. 1957, p. 95-98.

Adhesives are not yet used for highly stressed metal-to-metal joints in Germany but their use is increasing as more engineering information about their behavior is obtained. (K12)

60-K. Three Ways to Cut Brazing Costs. Ralph Raidy. *Steel,* v. 140, Jan. 21, 1957, p. 73-74.

Maker of tubular steel assemblies reduces cost by change to silver brazing alloy, installing gas fired brazing machines and using vapor flux. (K8, 17-3)

61-K. Weld Penetration Characteristics of Atmosphere-Melted Versus

Vacuum-Melted Zircaloy. S. A. Toftegaard, *U. S. Atomic Energy Commission. KAPL-MEMO-SAT-1,* Nov. 1, 1956, 8 p. (CMA)

A weld study was conducted to determine the variability of weld penetration in vacuum and inert gas-melted Zircaloy and to determine the effects of prior vacuum annealing and surface machining on penetration. An inert gas-melted material has superior penetration; surface machining is deleterious to weld penetration, and vacuum annealing somewhat so. (K9n, 3-20; Zr)

62-K. Hydraulic Pit Props. *Welding and Metal Fabrication,* v. 25, Jan. 1957, p. 2-5.

Quantity production of mine props achieved through series of simple operations using automatic arc welding machines for circular welds and manual welding for other operations. (K1, 18-24)

63-K. A Constant Potential Power Source for the Self-Adjusting Arc Welding of Aluminum and its Alloys. J. G. Young. *Welding and Metal Fabrication,* v. 25, Jan. 1957, p. 6-8.

Experimental work with constant potential source indicates that calibration and settings for particular welding conditions are easier and arc control may be simplified. (K1, W29; Al)

64-K. Tubular Fabrication—Part 4. A. Scott. *Welding and Metal Fabrication,* v. 25, Jan. 1957, p. 30-32.

Diagrams, weld defects and causes. Suggests minimization of distortion by presetting for correction after welding. (K9p; 4-10, 9-24)

65-K. Welding Precipitation-Hardening Stainless Steels. George E. Linnert. *Welding Journal,* v. 36, Jan. 1957, p. 9-27.

Classification of grades by microstructure. Description of groups. 17-4PH, 17-7PH, and 17-10PH steels were studied as to welding behavior. 11 ref. (K general; SS)

66-K. Argon-Hydrogen Shielding-Gas Mixtures for Tungsten-Arc Welding. T. McElrath and E. F. Gorman. *Welding Journal,* v. 36, Jan. 1957, p. 28-35.

Smooth clean welds, more fluid puddle, longer electrode life and faster weld speeds can be obtained with argon-hydrogen mixtures than with argon or helium. Unsatisfactory for welding aluminum, copper and carbon steel and will not work with certain techniques. (K1d; SS, Ni)

67-K. Coating Ingredients' Influence on Surface Tension, Arc Stability and Bead Shape. T. H. Hazlett. *Welding Journal,* v. 36, Jan. 1957, p. 18s-22s.

Attempt made to isolate and determine the effects of a number of the important compounds currently used in the manufacture of commercial welding electrodes. 5 ref. (K1a, W29)

68-K. Metal Transfer Characteristics in Gas-Shielded Arc Welding. H. C. Ludwig. *Welding Journal,* v. 36, Jan. 1957, p. 23s-26s.

Conventional inert-gas-shielded consumable-electrode type welding equipment was used. A high speed camera with speed of 7000 frames/sec was used. Author suggests that major force component causing metallic drop ejection from the electrode is electromagnetic action. 7 ref. (K1d, X5)

69-K. The Weaving of Spring Steel Wires. A. Jasper. *Wire,* Dec. 1956, p. 38-41.

Wire thickness and mesh width; weaving with shuttles; capacity of loom as affected by use of spring steel wires and mesh assembling looms. (K13s; ST, SGA-b, 4-11)

70-K. (English.) Welding of Steel With Consumable Electrodes Under a Shield of Carbon Dioxide. E. Sellier. *Acier-Stahl-Steel,* v. 21, Dec. 1956, p. 489-492.

Carbon-shielded welding with consumable electrodes is cheaper than and presents no manufacturing difficulties over the argon-shielded process. (K1d; ST)

71-K. Blind Riveting: New Type of Mandrel-Expanded Rivet With Sealed End. *Aircraft Production,* v. 19, Jan. 1957, p. 42.

A completely airtight and watertight joint is produced and the mandrel is completely enclosed. (K13n)

72-K. Welding for the Sawdoctor: Remarkable Achievements With Oxy-Welding. J. D. English. *Australasian Engineer,* v. 49, Nov. 7, 1956, p. 62-63.

Recent advances in welding saws. (K2h)

73-K. How to Weld Aluminum Bus. *Electrical World,* v. 147, Jan. 14, 1957, p. 60-61.

Gas welding compared with electrical welding; heat zone, welding speed; use of helium and argon. (K1, K2; Al, SGA-q)

74-K. Welding in the United States: Various Processes Compared. *Engineering,* v. 182, Dec. 21, 1956, p. 779-780.

Shielded-arc welding, resistance welding; testing welds. (K1, K3, K9r)

75-K. Complete Inert Gas Shield Is Key to Successful Zirconium Welding. G. E. Elder, et al. *Industry and Welding,* v. 30, Feb. 1957, p. 52-56, 58, 61, 87. (CMA)

Welding operations performed on Zircaloy core tanks described. Inert gas shielding is necessary. Fabricated parts were chosen for welding rather than forged parts and the number of welds were minimized. All welding was done in the downhand position. Inspection was accomplished by ultrasonic and radiographic means. (K1d; Zr)

76-K. Weld Stainless With Submerged Arc. W. E. McFee. *Industry and Welding,* v. 30, Feb. 1957, p. 64-66, 89.

Properly adjusted submerged arc provides protection while welding stainless. (K1e; SS)

77-K. Five Points to Remember When You Arc Weld Copper Alloys. *Industry and Welding,* v. 30, Feb. 1957, p. 71-77.

Suggested procedures include use of coated electrodes, careful cleaning, high preheat and downhand welding. (K1; Cu)

78-K. Resistance Welding Applied to Airframe Construction. N. K. Gardner. *Machinery,* v. 90, Jan. 25, 1957, p. 210-214.

Examples of the use of spot and seam welding; types of welding machines in use; procedures adopted to ensure high standard of weld efficiency; applications of flash butt welding. (K3, T24a)

79-K. Welding and Brazing the Newer Metals. F. G. Cox. *Metal Progress,* v. 71, Jan. 1957, p. 204, 206, 208. Digest of article from *Murex Ltd. Review,* v. 1, 1956, p. 429-463. (CMA)

Use of the fabricated part is the major consideration in selecting joining method for zirconium, molybdenum and other refractory metals. Sheet thickness is an important criterion for most methods. Argon or vacuum is necessary for brazing. (K general; Zr, Mo)

80-K. The Development of the Science and Technique of Arc Welding in the U.S.S.R. N. N. Rykalin. *Sheet Metals Industries,* v. 14, Jan. 1957, p. 35-40.

Automatic arc welding, automatic welding units, welding fluxes, electric slag welding, gas-shielded arc welding, use of alternating current and research work. (K1)

81-K. A Metallurgist Looks at Flash Welding. Hiram Brown. *Steel,* v. 140, Jan. 28, 1957, p. 90-91.

Suggestions by a metallurgist for testing and improving flash butt-welds. (K3r)

82-K. Try Carbide Bonding With a No-Mix Epoxy. Bernard Gould. *Tooling and Production,* v. 22, Feb. 1957, p. 79-84.

Development of a single-component epoxy paste adhesive providing a nonflowing, low-heat "chemical fastener" eliminating distortion and embrittlement in the critical joining of dissimilar materials. (K12)

83-K. Production of Sound Ductile Joints in Molybdenum. M. I. Jacobson, D. C. Martin and C. B. Voldrich. *U.S. Air Force, Wright Air Development Center, Technical Report 53-401,* Jan. 1954, 72 p. (PB 123916) Abstracted in *U.S. Government Research Reports,* v. 27, Jan. 18, 1957, p. 21. (CMA)

Welding and brazing methods for molybdenum were studied and results are reported for tungsten-arc welding and induction brazing tests. Although weldments were ductile longitudinally they were brittle transversely to the welding direction because of recrystallization. The brazing alloys giving best results were Inconel and Haynes Alloy 25. (K1, K8k, Mo, SGA-f)

84-K. Inert Tungsten-Arc Welding of S3G Zircaloy Channel Sections. S. A. Toftegaard. *U.S. Atomic Energy Commission. KAPL-M-SAT-2,* Nov. 14, 1956, 7 p. (CMA)

A joint design was developed for Zircaloy-2 weldments which gave the desired contour for inert tungsten-arc welding; full penetration was achieved without drop-through in a single pass. Addition of filler metal was unnecessary. (K1d; Zr)

85-K. Research and Development for the Welding of Titanium and Titanium Alloys. J. J. Chyle and I. Kutuchief. *U.S. Watertown Arsenal Laboratory, Report 401/89-16,* April 1954, 79 p. (PB 111849). Abstracted in *U.S. Government Research Reports,* v. 27, Feb. 15, 1957, p. 61. (CMA)

Welding tests were conducted on titanium alloys containing manga-

nese, chromium, iron, aluminum and molybdenum; filler metal in the form of strips was removed from the parent plate. The sigma method was employed, using helium and a thoriated grade of tungsten electrode. (K1d; Ti)

86-K. Weldability of Three Ferritic Chromium-Molybdenum Bearing Steels. B. Trehearne. *Welding and Metal Fabrication,* v. 25, Feb. 1957, p. 48-52.

Three ferritic creep-resisting, medium high-temperature service steels examined to determine satisfactory welding conditions: (a) 1% Cr, ½% Mo, (b) 4-6% Cr, ½% Mo, (c) 2¼% Cr, 1% Mo. Controlled thermal severity tests on (a) and (b). 9 ref. (K9s; AY)

87-K. Aspects of the New Monel and Nickel Arc-Welding Electrodes. F. A. Ball and D. R. Thorneycroft. *Welding and Metal Fabrication,* v. 25, Feb. 1957, p. 59-64.

Welding overlays on mild steel, welding clad steels, welding solid nickel and Monel; hot-cracking tests, hardness of the weld metal, analysis and microstructure. (K1g, W29; Ni)

88-K. Resistance Welding—the Past and Present. Jack Fairlie. *Welding Engineer,* v. 42, Jan. 1957, p. 20-23.

Summary of developments since 1877 when Thompson perfected the resistance welder. (K3)

89-K. Arc Welding Defined: Learning to Work With Weldability. Bela M. Ronay. *Welding Engineer,* v. 42, Jan. 1957, p. 26-28.

Weldability is determined by expansion and contraction curves on heating and cooling and ductility at all temperatures during cooling. (K9s, K1)

90-K. These Six Steps Are the Secret to Good Silver-Brazed Joints. *Welding Engineer,* v. 41, Dec. 1956, p. 28-29.

Steps include: good fit and clean metal, proper fluxing, use of supporting parts, proper heating, and final cleaning. (K8; *Ag*)

91-K. "How to Do It" With an Oxy-Acetylene Torch. T. B. Jefferson. *Welding Engineer,* v. 42, Jan. 1957, p. 32-34.

Joint preparation and correct procedure in oxy-acetylene welding. (K2h)

92-K. Filler Metals for Joining. Orville T. Barnett. *Welding Engineer,* v. 41, Dec. 1956, p. 54-60.

Deposition characteristics and mechanical properties of manual arc welds using iron powder electrodes of several types. (K1, 1-2; *Fe,* 6-18)

93-K. Welding of High-Strength Pressure Vessel Steels in Heavy Sections. A. P. Bunk. *Welding Journal,* v. 36, Feb. 1957, p. 62s-66s.

Welding procedure qualification tests developed for 4-in. thick plates in accordance with ASME requirements; results for A201 A steel, A302 grade B steel, Ni-Cu-Mo-V steel and Mn-Ni-Cr-Cu-Mo-V steel. (K9r; SGB-a, 4-3)

94-K. Roll Planishing Improves Weld-Joint Efficiency and Quality. H. L. Meredith and B. R. Russell. *Welding Journal,* v. 36, Feb. 1957, p. 113-117.

Factors causing loss in weld-joint strength, effect of cold working sheet metal, roll planishing, effect of weld size; weld shrinkage and tensile strength of planished weld. (K9q, Q27a)

95-K. Study of Interrupted Welding of Heavy-Wall Steam Pipe. I. A. Rohrig, J. O. Smith and E. G. Shifrin. *Welding Journal,* v. 36, Feb. 1957, p. 128-131.

Alloy steel pipe (2¼% Cr, 1% Mo) in wall thickness up to ¾ in. can safely be welded with interrupted heat cycles if proper precautions are exercised. (K1; AY, 4-10)

96-K. Hydrogen vs. Acetylene vs. Inert Gas in Welding Aluminum Alloys. J. Koziarski. *Welding Journal,* v. 36, Feb. 1957, p. 141-148.

Investigations concerned primarily with type, amount and location of porosity and fusion obtained with these methods of welding. 16 ref. (K1d, K2h, K2j, 9-18; Al)

97-K. Soldering Fluxes and Flux Principles. A. Z. Mample. *Western Union Technical Review,* v. 11, Jan. 1957, p. 35-42.

Thermal and mechanical considerations, flux corrosion and its conductivities, self-neutralizing fluxes; fluxes from the point of view of metallurgy. 7 ref. (K7; RM-q)

98-K. (French.) **The Bonding of Light Metals.** J. J. Meynis de Paulin. *Chimie et Industrie,* v. 76, Dec. 1956, p. 1276-1290.

Survey of the principal adhesives available in France for the warm and cold bonding of metals, with special reference to the heat setting phenolic-vinylic, acrylonitrile-phenolic and ethoxylic glues. (K12)

99-K. (German.) **The Railway Bridge Over the Grand Emme Near Luterbach.** M. H. Gut. *Zeitschrift für Schweisstechnik,* v. 47, Jan. 1957, p. 2-10.

A completely welded steel bridge is described. Selection of materials, testing methods and the construction of the bridge. 4 ref.
(K general, T26p)

100-K. (German.) **Brazing of Bicycle Parts at the "Allegro" Company.** E. W. Plüss. *Zeitschrift für Schweisstechnik,* v. 47, Jan. 1957, p. 11-12.

All parts involved are heated in a combustion chamber slightly above the melting temperature of the brass solder by means of an oil burner. The brass solder is introduced in form of a wire. (K8j)

101-K. (Russian.) **Manufacturing Welded Rotors From Austenitic Steel.** V. A. Toropov and G. I. Mart'yanov. *Energomashinostrovenive,* no. 11, Nov. 1956, p. 18-20.

The technological process of the welding and heat treatment of turbine rotors made of austenitic steel, guaranteeing low radial and axial deformation of the rotor.
(K general, J general, T7; SS-e)

102-K. (Russian.) **Soldering of Aluminum and Its Alloys With the Use of Ultrasonics.** G. I. Apukhtin. *Informatsiya O Nauchno-Issledovatel' skikh Rabotakh,* No. I-56-3, Moscow, 1956.

New method for soldering aluminum and its alloys with the aid of ultrasonics, in which mechanical cleansing of the surfaces is supplanted by the phenomena of cavitation in the fused solder, produced by ultrasonic vibrations in the soldering iron tip. Generation of the vibrations is accomplished by means of magnetostriction vibrators. The system, apparatus, methods, and application are described. The method may be adapted to ferrous and nonferrous metals. (K7h, 1-2; Al)

103-K. (Spanish.) **Benefits Derived From the Use of Welding in Japan.** Akira Turuta and Iwao Onisi. *Ciencia y Técnica de la Soldadura,* v. 6, Sept.-Oct. 1956, 13 p.

Welding applications in construction and industry; examples of new ideas and production methods. Welding, oxygen cutting and allied techniques becoming widely used. Detail of calculations and procedures used to weld large spherical storage chambers, using tank of water as positioner. (K general)

104-K. (Spanish.) **Chemical Factors Affecting the Weldability of Low-Carbon Structural Steels.** J. M. Sistiaga. *Ciencia y Técnica de la Soldadura,* v. 6, July-Aug. 1956, 9 p.

Factors that affect quality of welded joints; cracking, porosity and brittleness; influence of chemical composition of materials used, with special consideration of hydrogen and silicon. 14 ref.
(K9s, 2-10; CN-g)

105-K. (Spanish.) **The Largest High-Pressure Spherical Gasometer in the World.** August Klönne. *Ciencia y Técnica de la Soldadura,* v. 6, Sept.-Oct. 1956, 6 p.

Procedures used in construction entirely by welding of 100,000 cubic meter capacity gasometer in Cologne, Germany. (K general, T26)

106-K. (Spanish.) **Production Advantages Attained by the Use of Automatic Arc Welding.** E. A. Gill. *Ciencia y Técnica de la Soldadura,* v. 6, Sept.-Oct. 1956, 7 p.

Advantages of automatic welding equipment in both large and small-scale production; importance of production planning, proper equipment, work procedures; measurement of productivity; description of automatic equipment; comparison of manual and automatic arc welding speeds. (K1, 18-24)

107-K (Spanish.) **Production Advantages of Electric Resistance Welding in the Manufacture of Home Refrigerators, Bicycles, Steel Containers and Storage Batteries.** R. Negro Parraga. *Ciencia y Técnica de la Soldadura,* v. 6, July-Aug. 1956, 15 p.

Water cooling of welding equipment, selection of electrodes, voltage, current and duration of operation, with practical rules for obtaining wood welds. Equipment employed, shop practice and controls realized in average size plants manufacturing above products. (K3; ST)

108-K. (Spanish.) **A Quantitative Production Control Procedure for Welding Work.** R. Rein Carso. *Ciencia y Técnica de la Soldadura,* v. 6, July-Aug. 1956, 5 p.

Two methods of determining work performed by welder: (1) direct measurement of work turned out, (2) check of work by number of electrodes used up; problems encountered in use of each method. Control forms shown.
(K general, A5d)

109-K. (Spanish.) **Repair of Engine Frame and Head of a Tractor by Means of Welding.** O. Zabara. *Ciencia y Técnica de la Soldadura,* v. 6, July-Aug. 1956, 2 p.

Done by cold arc welding with special low-melting point electrodes. Continuous current and inverted polarity used to avoid overheating of the work. (K1, 1-17, 18-22)

110-K. (Spanish.) **Study on the Joining of Copper Cables by Means of Welding.** Oleh Zabara. *Ciencia y Técnica de la Soldadura,* v. 6, Sept.-Oct. 1956, 3 p.

Electric welding with argon-protected arc so as not to modify conductivity of cables and in order to avoid electrolytic phenomena in grounds. (K1d, X15; Cu)

111-K. (Spanish.) **The Use of Welding in Building a Ship.** A. Pérez A. Quinones and F. Alonso Garcia. *Ciencia y Técnica de la Soldadura,* v. 6, July-Aug. 1956, 4 p.

Study of best way to prefabricate a given type of ship; comparison of welds made in horizontal and vertical positions in order to find relation between cost of vertical seams of prefabricated sections; determination of relation between assembly cost and size of sections for typical ship, in order to determine the most suitable prefabricated section in each case. (K general, T22)

112-K. (Spanish.) **Welding.** *Ciencia y Técnica de la Soldadura,* v. 6, July-Aug. 1956, 12 p.; Sept.-Oct. 1956, 6 p.

Electric arc welding. (To be continued.) (K1)

113-K. **Welding Zirconium Requires Special Techniques.** W. R. Gall. *American Machinist,* v. 100, Dec. 1956, p. 65-67.

Techniques employed in welding heavy zirconium plate and forgings for an atomic reactor vessel, using helium shielding. (K1d; Zr)

114-K. **Stud Welding, Its Use in the Oil and Chemical Industries.** E. F. Robinson. *Machinery Lloyd,* v. 29, Jan. 1957, p. 89-92.

Types of studs, technique of applying studs, applications of stud welding. (K1f)

115-K. **Fabrication of the Homogeneous Reactor Test Vessel Assembly.** L. F. Bledsoe, et al. *American Society of Naval Engineers, Journal,* v. 69, Feb. 1957, p. 123-130. (CMA)

Inert-gas-shielded tungsten-arc welding process was employed in the fabrication of a Zircaloy-2 core vessel and pressure vessel. Unusual problems were involved because of design. (K1d, T11; Zr)

116-K. **What Are Welding Stresses?** H. J. Nichols. *Canadian Metals,* v. 20, Feb. 1957, p. 30-32.

Plastic flow, weld metal shrinkage, amount of restraint on welded part and other factors determine residual and reaction stresses; effects of stresses on welded structure. (K9n, Q25)

117-K. **Some Problems of Aluminum Connection.** C. T. Marx. *Electrical Energy,* v. 1, Dec. 1956, p. 109-112.

Methods and problems of connecting aluminum are discussed and attention is drawn to differences in practice between copper and aluminum joining. Soldering, bolting and crimping are discussed. (K7, K13; Al)

118-K. **No-Mix Epoxy Joins Metals Fast.** Bernard Gould. *Iron Age,* v. 179, Feb. 21, 1957, p. 94-95.

One part epoxy adhesive for metal to metal joining requires no mixing or curing additive, has long storage life, variable curing cycle, relatively high bond strength. (K12; NM-d)

119-K. **Weld Quality Rides With Steel Selection.** A. C. Ward. *Iron Age,* v. 179, Feb. 21, 1957, p. 104-106.

Manufacturing methods, analysis and properties for typical low, medium and high-carbon steels, hot rolled or cold worked, and their effect on welding procedures and electrode selection. (K general; CN)

120-K. **Resistance Welding: Some Recent Developments.** N. K. Gardner. *Mass Production,* v. 33, Feb. 1957, p. 63-67, 118.

Spot, seam and resistance welding at the design stages in aircraft industry. (To be continued.) (K3, T24, 17-1)

121-K. **Adhesives in Metal Bonding.** *Mechanical World and Engineering Record,* v. 137, Feb. 1957, p. 54-58.

Development of new theories of adhesion side by side with advances made in producing synthetic resin adhesives offers the engineer a new method of metal joining. The technique has been applied mainly to aircraft construction, and its chief merit is in decreasing the weight of the structure. (K12)

122-K. **Metal Arc Welding of Mild Steel Plate.** R. S. Bolton. *New Zea-*

land Engineering, v. 11, Dec. 15, 1956, p. 400-408.

Selection of plate for welded structure; cracking in welds, welding stresses and stress relief, welding defects, welding procedure; automatic welding. 21 ref. (K1, J1a, 9; CN)

123-K. Some Aspects of the Welding of Structural Steel. W. Burrows. *New Zealand Engineering,* v. 11, Dec. 15, 1956, p. 415-418.

Classification and coding of electrodes for metal arc welding of mild steels and medium high-tensile steel of structural quality according to British standards; alloying elements and refining of steels, manufacture of electrodes, electrode testing; welding procedure; examination and repairs of welds.
(K general, W29; ST, SGB-s)

124-K. On the Welding Arc Atmosphere (Continued.) Iwao Ohmishi and Yoneo Kikuta. *Osaka University Technology Reports,* v. 6, Mar. 1956, p. 155-161.

Investigation of the partial pressure of hydrogen in arc atmosphere and the volume of hydrogen in deposit metal, using commercial electrodes manufactured and used for industrial purpose in Japan.
(K1, W29)

125-K. Effect of the Tip Temperature on the Gas Ratio of Oxy-Acetylene Flame in the Low Pressure Type Welding Torch. Iwao Onishi and Masao Mizuno. *Osaka University Technology Reports,* v. 5, Oct. 1955, p. 453-467.

The temperature rise of torch under various conditions was measured with thermocouples at several positions of each torch, and the change of mixed gas ratio (oxygen-acetylene) which is caused by the temperature rise of tips was determined in accordance with the continuous measurement of gas pressure and its consumption. (K2h, 1-2)

126-K. New Way to Weld Aluminum. *Steel,* v. 140, Feb. 25, 1957, p. 108-111.

Alforge, a patented welding process, uses limited heat (350 to 500° F.) and high forging pressures to join aluminum or magnesium to give a high-strength weld. Parts are heated by flame. (K5h; Al)

127-K. Nickel-Alloy Pump Is Tig-Welded for AEC. E. Nutter. *Welding Engineer,* v. 42, Feb. 1957, p. 61-64.

Multiple pass technique with tungsten tip and argon shield was used for welding high-temperature nickel alloy centrifugal pump assemblies. Die penetration tests were made and finished parts were heat treated in a helium and hydrogen atmosphere. (K1d, W13, 17-7; Ni)

128-K. (French.) **A New Clamp Joint for Tubular Bodies.** *Revue de l'Aluminium,* no. 239, Jan. 1957, p. 81-82.

New method for clamp joining sheets, the main feature of which consists of trapezoidal tongs with stoppers which interlock. The assembly is obtained by folding down the stoppers on a mandrel. This process provides a way of making hollow bodies with curved sheet, especially suited for the construction of towers and masts.
(K13q; Al, 4-3)

129-K. Modern Welding. H. G. Taylor. *British Petroleum Equipment News,* v. 5, no. 5, Winter 56/57, p. 56-61.

Submerged arc, argon arc and inert arc welding discussed. (To be continued.) (K1)

130-K. A Review of Inert Arc Welding (Stainless Steel). W. E. McFee. *Industry and Welding,* v. 30, March 1957, p. 54-59.

Significant features and advantages of inert-gas shielded arc welding of stainless steels. (K1d; SS)

131-K. 300 Silver Brazed Joints Simplify Fabrication of Dissimilar Metals. *Industry and Welding,* v. 50, March 1957, p. 62-68.

Silver alloy braking of joints in large air separators manufactured by Air Products Inc., Allentown, Pa. Dissimilar metals brazed together include various combinations of Type-304 stainless steel, cast and forged bronze and copper, and Carboloy. (K8; SS, Cu, W, 6-19)

132-K. New Arc Welding Process Speeds Fabrication of Carbon Steels. *Industry and Welding,* v. 30, March 1957, p. 44-48, 69-70.

New manual, semi-automatic welding process producing high-quality welds in carbon steel has been introduced by Linde Air Products, under the name "Unionarc", employing a continuously fed wire electrode magnetically coated with flux and shielded in a CO_2 gas atmosphere.
(K1a; CN)

133-K. Aircraft Industry Makes Most of Resistance Welding. *Industry and Welding,* v. 30, March 1957, p. 74-79.

Resistance welding makes possible high-quality, high-production structural assemblies for modern aircraft and has decided advantages over riveting techniques. (K3, T24)

134-K. Here's a "Plug" for CO_2 Welding. *Industry and Welding,* v. 30, March 1957, p. 80-81, 114.

Development of a more efficient plug welding technique by the Chicago Steel Tank Co. by switching to CO_2 welding, resulting in increased metal deposition rates and better operator control. (K1d)

135-K. Magnetic Flux Combines With Carbon Dioxide to Shield Arc. *Machinery,* v. 63, March 1957, p. 178-179.

Continuously fed electrode wire that is magnetically coated with flux and shielded in an inert-gas atmosphere is the basis of a new Unionarc welding method. Weld deposition rate is increased over that realized with coated electrodes. (K1a)

136-K. Here's a New Welding Process. *Steel,* v. 140, March 4, 1957 p. 126-128.

Linde's Unionarc combines continuously fed wire electrode, carbon dioxide, magnetic flux and direct current to produce strong, smooth welds in mild steel with higher deposition rate than conventional coated electrodes. (K1a)

137-K. Inert-Gas Tungsten-Arc Butt Welding of Zircaloy-2 Tubes. J. W. Lingafelter. *Welding Journal,* v. 36, March 1957, p. 230-235. (CMA)

A length of internally ribbed Zircaloy-2 tube was produced in a tube butt-welding operation using inert-gas and the tungsten arc technique. The precedure is adaptable to automatic operation. The welds contained no significant porosity and no corrosion products were evident in the corrosion tests.
(K1d; Zr, 4-10)

138-K. (French.) **Good Silver Brazing Demands Six Conditions.** A. W. Swift. *Machine Moderne et Revue Mecanique,* no. 575, Feb. 1957, p. 8-10.

To obtain solid and nonporous silver brazed joints attention must be paid to correct spacing, cleanliness, careful application of flux, adequate support of the parts during the operation, heating and rapid removal of the flux. (K8; *Ag*)

139-K. (French and German.) **The New Brown Boveri Automatic Arc-Welding Machine.** A. Schmid. *Zeitschrift für Schweisstechnik,* no. 2, Feb. 1957, p. 28-37.

Details concerning the construction and operation of the new Brown Boveri U1200 automatic welding machine. Describes its adaptability for all types of arc welding, the simplicity of its electrical control mechanism and the ease in the manipulation of the electrodes and core wire. (K1, 1-2)

140-K. Brazing Beryllium Tubing to High-Temperature Alloy Collars. K. G. Wikle and R. Magalski. Brush Beryllium Co. *U.S. Atomic Energy Commission,* COO-310, June 1956, 22 p.

A vacuum-furnace brazing technique by which beryllium tubes can be lap brazed to Type 405 stainless steel and other high-temperature alloys has been developed. The resultant lap joints have a shear strength up to about 7000 to 8000 psi. at 750° F. 6 ref.
(K8, 1-23; SS, Be, 4-10)

141-K. Joint Design for Making Root Pass Welds Without Filler Material. L. C. Lemon and W. R. Smith. General Electric Co. *U.S. Atomic Energy Commission,* HW-44245, July 9, 1956, 15 p.

Several joints were evaluated and both the consumable insert joint and the newly developed "G.E." joint appeared to fulfill the requirements. Both joints provide a weld whose quality can be determined by visual inspection of the near side of the weld, and both can be made with the minimum of welder skills and training. The consumable insert joint is the more costly because of the longer time required for machining, fitting, and welding, and because of the high cost for the individual insert. (K1, 17-1)

142-K. Welding of Type 347 Steels. Statistical Analysis of the Effect of Various Elements on the Crack Sensitivity of Fully Austenitic Type 347 Welds. Arthur Hoerl and Thomas J. Moore. Arcos Corp. *U.S. Atomic Energy Commisssion,* NYO-3500, Oct. 29, 1956, 25 p.

Carbon and manganese are shown to be the most potent elements in reducing cracking, and phosphorus and sulphur are the strongest and most definite crack promoters.
(K general, 2-10, 9-22; SS)

143-K. Resistance Welding Techniques. C. A. Burton. *Electrical Review,* v. 160, Feb. 15, 1957, p. 273-278.

Advantages and applications to the aircraft, auto and railway industries of flash-butt, spot, stitch and seam welding. (K3)

144-K. Electricity Plays Many Roles in Welding. A. C. Ward. *Iron Age,* v. 179, Mar. 14, 1957, p. 140-142.

Relation of welding voltage, average time and circuit direction on weld heat. Influence of electrode type and arc length. (K1, 16-11, W29)

145-K. High Temperature Brazing Proves O.K. for Jet Engines. John V. Long, George D. Cremer and Richard S. Mueller. *SAE Journal,* Mar. 1957, p. 43-49.

Some examples of brazing technique for producing high-temperature brazed assemblies of turbojet-engine components, such as anti-icing panels, compressor casings, compressor stator blades, heat exchangers, turbine rub rings, filled honeycomb cores, and turbine nozzles. (K8, 2-12, T24b)

146-K. Tig Welded Zircaloy-2 Atomic Fuel Tank. *Welding Engineer,* v. 42, April 1957, p. 76. (CMA)

The tungsten-inert gas welding process was used by Newport News Shipbuilding and Drydock Co. to fabricate a nuclear fuel tank of Zircaloy-2. Conical and spherical sections and forged pipes were welded together. Joints were welded automatically and insert wire and interior perforated disk cross sections were manually welded. In all cases the Tig torch was stationary and the workpiece moved. (K1d, 1-2, T11; Zr)

147-K. Effect of Irradiation on Weldability of ASTM A212, Grade B. W. R. Hutchinson. *Welding Journal,* v. 36, Mar. 1957, p. 105s-112s.

Weldability tests were conducted on ASTM A212 Grade B pressure plate material in both the irradiated and unirradiated conditions. Results indicate that prior irradiation by an integrated thermal flux of 10^{16} nvt. does not have much effect on the weldability of pressure vessel material. 25 ref. (K9s, 2-17, T26q; AY)

148-K. Alloys for Brazing Thin Sections of Stainless Steel. A. S. McDonald. *Welding Journal,* v. 36, Mar. 1957, p. 131s-140s.

Suitability of the alloys 72Ag-28Cu, 72Ag-28Cu + 0.5Li, 85Ag-15Mn, 85Ag-15Mn + 0.5Li and 68Mn-32Ni are discussed as candidates for brazing thin sections of stainless steel. The results of wetting tests on Types 304, 321 and 17-7 PH stainless steel in hydrogen atmosphere at various dew points and temperatures are presented. 5 ref.
(K8, P13; SS, SGA-f)

149-K. Properties and Weldability of High-Strength Pressure-Vessel Steels in Heavy Sections. J. H. Gross and R. D. Stout. *Welding Journal,* v. 36, Mar. 1957, p. 157s-167s.

Study of the effects of plate thickness and of position in the plate on the mechanical properties and weldability of these materials.
(K9s, Q general, T26q; ST, 4-3)

150-K. Inert-Gas Tungsten-Arc Butt Welding of Zircaloy-2 Tubes. J. W. Lingafelter. *Welding Journal,* v. 36, Mar. 1957, p. 230-235.

Techniques employed for welding internally ribbed Zircaloy tubes; analysis of mechanical, metallurgical and corrosion data obtained on duplicate test samples to determine weld properties. (K1d, K9r; Zr, 4-10)

151-K. Joint Design for Making Root-Pass Welds Without Filler Metal. L. C. Lemon and W. R. Smith. *Welding Journal,* v. 36, Mar. 1957, p. 240-242.

Describes a new, practical joint design and welding technique for making sound root-pass welds without the use of backing rings in stainless steel, killed steel and aluminum piping.
(K1, 17-1; SS, ST-c, Al, 4-10)

152-K. Peripheral Welding of Internally-Clad Steel for Nuclear Reactor Application. W. Leonard and J. C. Thompson, Jr. *Welding Journal,* v. 36, Mar. 1957, p. 243-251.

Special procedures have been developed for welding a spherical pressure-vessel shell made of carbon steel plate clad with Type 347 stainless steel. 3 ref.
(K1d, W11, 17-7; CN, *SS,* 8-16)

153-K. (French.) **Machine Welding of Special Steels and Light Alloys in an Argon Atmosphere.** R. Arnaud. *Metaux-Corrosion-Industries,* v. 32, Jan. 1957, p. 38-45.

Describes a machine capable of automatic argon welding permitting a precise control of the essential parameters of the welding process. (K1d, 1-2)

154-K. (Spanish.) **Welding.** *Ciencia y Tecnica de la Soldadura,* v. 6, Nov.-Dec. 1956, 2 p.

Thermo-electronic emission. (To be continued.) (K1)

155-K. (Spanish.) **Technique and Applications of Wedge Welding.** Wilhelm Hofmann. *Ciencia y Tecnica de la Soldadura,* v. 6, Nov.-Dec. 1956, 4 p.

Copper and aluminum profiles are welded by giving the copper end a cone or wedge shape and introducing the shaped end into aluminum by means of pressure. Best welding temperature is between 548° C. and melting point of aluminum. A eutectic fluid which eliminates surface oxides is formed in the contact zone by diffusion. Steel and aluminum can be similarly joined by protecting the cone or wedge against oxidation with a zinc or silver coating. 6 ref.
(K5k; Cu, Al, ST)

156-K. (Spanish.) **Economic Aspects of Submerged Arc Welding in Naval Construction.** Vincenzo di Bella. *Ciencia y Tecnica de la Soldadura,* v. 6, Nov.-Dec. 1956, 12 p.

Summary of development and use of automatic welding in naval construction; examination of problems encountered, new work cycles, advantages and disadvantages of latter. Economic comparison of a job carried out by conventional methods and another done with modern automatic welding machines and oxy-acetylene cutting equipment. Shows importance of non-use index of machines and influence on total cost. (K1e, T22)

157-K. (Spanish.) **On the Use of Contactors and Electronic Control Equipment in Modern Resistance Welding Machines.** A. Plaza Alonso. *Ciencia y Tecnica de la Soldadura,* v. 6, Nov.-Dec. 1956, 14 p.

After brief exposition of general problems of control with reference to resistance welding machines, study is made of mercury vapor rectifier tubes, with special attention to characteristics, assembly and maintenance of ignitron-type electronic counters, choice of welding cycles and electronic control devices. 14 ref. (K3, 1-2)

158-K. Welding Repair of a Giant Turbine Runner. (Pt. 2). F. P. Y. Arseneault. *Canadian Metals,* v. 20, Mar. 1957, p. 46-51.

Records gouging and welding conditions used in the removal of segment of trailing edge of runner and repair by attachment of stainless steel strips. Pitting repaired by build-up of welded metal.
(K general, W11, 17-7, 18-22; SS)

159-K. Investigation and Development of High-Temperature Structural Adhesives. A. S. Kidwell and K. L. McHugh. Connecticut Hard Rubber Co. (Wright Air Development Center). *U.S. Office of Technical Services,* PB 121657, Sept. 1956, 75 p.

Various epoxy-modified silicone resin adhesives investigated as bonding materials for aluminum and stainless steel and for their ability to maintain strength at 500 and even 700° C. required for improved jet engines. (K12; NM-d34, Al, SS)

160-K. Ductility Related to Service Performance of Heavy-Wall Austenitic Pipe Welds. Henry M. Soldan and Charles R. Mayne. *Welding Journal,* v. 36, Mar. 1957, p. 141s-147s.

Correlation of the results of hot ductility tests with the fabrication and service performance of welds in heavy-wall austenitic-steel piping in high-temperature central station service. 14 ref.
(Q23p, 2-12; SS, 7-1, 9-22)

161-K. (French.) **Cost Study of Argon Shield Arc Welding of Aluminum and Its Alloys.** J. G. Young. *Revue de l'Aluminium,* no. 236, Oct. 1956, p. 953-962.

Method for calculating cost of argon shielded arc welding of aluminum and its alloys, both with refractory and consumable electrodes. In most applications arc welding under argon shield is faster and cheaper than riveting. (K1d, 17-3)

162-K. (German.) **New Working Devices Facilitate Contacting of Relay Springs.** Joseph Knoll. *Werkstatt und Betrieb,* v. 90, Feb. 1957, p. 147-148.

Mounting of rare metal contacts to relay springs by automatic riveting press with electronic time limiter and a vibration-promoting apparatus for arranging and feeding of rivets. (K13n; EG-b, SGA-r)

163-K. (Pamphlet—French.) **Practical Information on Argon Shielded Arc Welding of Aluminum and Its Alloys.** 54 p. 1956. L'Aluminium Francais, 23, Rue Balzac, Paris 8, France.

Survey of the two principal methods of argon shielded arc welding—with a refractory electrode and with a consumable electrode. Information concerning current selection, welding equipment such as types of torches, apparatus to supply water, electric power and argon; electrodes; protective clothing and masks; preparation of surfaces to be welded; methods and techniques of welding. (K1d, 1-2; Al)

164-K. (Pamphlet—French.) **Practical Information on Braze Welding and Brazing of Aluminum and Its Alloys.** 23 p. 1955. L'Aluminium Francais, 23, Rue Balzac, Paris 8, France.

Principle underlying braze welding and brazing; types of filler materials used; techniques employed; specification of conditions producing optimum results. (K8; Al)

165-K. (Pamphlet—French.) **Practical Information on the Oxy-Acetylene Welding of Aluminum and Its Alloys.** 48 p. 1956. L'Aluminium Francais, 23, Rue Balzac, Paris 8, France.

Equipment used in welding—torches, pressure regulators; preparation of surfaces (degreasing and pickling); nature and utilization of flux; methods of welding; including concise information on speed and consumption of gas; positioning; specifications of procedure for special alloys; terminal operations such as washing, cleaning and polishing. (K2h, 1-2; Al)

166-K. (Pamphlet—French.) **Practical Information on the Resistance Welding of Aluminum and Its Alloys.** 35 p. 1956. L'Aluminium Francais, 23, Rue Balzac, Paris 8, France.

Survey of resistance welding from the point of view of preparation of surfaces for welding—degreasing, scouring, pickling; types of welding machines; electrodes; current regulation, pressure regulation and timing; correlation of common defects with probable causes; methods of detecting flaws and quality control. (K3, 1-2, S13; Al)

167-K. (Book.) **Standard Specifications for Welded Highway and Railway Bridges.** 5th Ed. 86 p., 1956. American Welding Society, D2.0-56, 33 West 39th St., New York 18, N. Y. $1.50.

On the basis of extended experience, existing requirements have been revised and clarified so that specifications constitute a more workable set of requirements for the effective use of welding in the construction of bridges and other structures subject to dynamic loadings. Important additions are provisions for use of a special welded bridge steel and submerged arc welding requirements.
(K general, S22, T26p; ST)

168-K. Welding Techniques in Atomic Energy Plants. I. H. Hogg. *Atomics and Nuclear Energy,* v. 8, Mar. 1957, p. 77-99.

Details of the particular problems confronting the welding engineer in the construction of atomic energy plants and the methods by which these were overcome. 29 ref.
(K general, W11)

169-K. Welding Steel Castings. *Australasian Manufacturer,* v. 41, Feb. 16, 1957, p. 88-95, 106-107.

Establishing welding procedures; advantages of tungsten inert-gas arc welding, metallic inert-gas arc welding and submerged arc welding.
(K1d, K1e; ST, 5)

170-K. New Unionarc System Features Magnetic Flux. *Canadian Machinery,* v. 68, Mar. 1957, p. 169-172.

Unionarc system ensures good visibility and a high rate of deposit. Materials need not be clean and are easily and neatly bridged. (K1e)

171-K. Induction Brazing. A. T. Templin and H. S. Peterson. *Machine Design,* Mar. 21, 1957, p. 150-153.

Induction brazing is widely used for joining parts in high production. High-volume parts produced as one-piece units may show savings by conversion to two-piece brazed assemblies. When volume is high enough to justify the equipment involved, parts originally joined by hand brazing, furnace brazing or arc welding may be readily redesigned for induction brazing. (K8k)

172-K. Resistance Welding: Some Developments. N. K. Gadner. *Mass Production,* v. 33, Mar. 1957, p. 86-90, 97.

Reasons for adoption of resistance welding by the aircraft industry for many new applications. Design, quality control and productivity discussed. (K3, T24, 17-1)

173-K. Zirconium Welded in Dry Box. *Metalworking,* v. 13, Apr. 1957, p. 4-6. (CMA)

In welding atomic reactor channels the entire zirconium assembly is placed inside a dry box filled with inert gas. The fixture moves horizontally in the chamber on its wheels. Tungsten electrode and other equipment used by the Nuclear Products Division, Superior Tube Co. (K1d, 1-2; Zr)

174-K. Welding Alloy Zirconium Requires Special Techniques. W. R. Gall. *Metalworking Production,* v. 101, Feb. 22, 1957, p. 333-335.

Fabrication of zirconium vessel for core of nuclear reactor by use of

zirconium wire with arc completely shielded by helium; cleaning, welding and testing procedure.
(K1d, T11; Zr)

175-K. Boom in Welding. *Scope*, Mar. 1957, p. 30-60.

Progress in the welding industry, especially in gas welding repair; electric arc welding—manual, semi-automatic and automatic; resistance welding for many manufacturing operations. (K general)

176-K. Background for Evaluation of Acetylene and Propane. J. Okladek. *Welding Engineer*, v. 42, Mar. 1957, p. 31-34.

Physical and chemical properties of acetylene and propane procedure for comparing value in metal cutting and welding operations. (K2, G22g)

177-K. Welded "Blankets" of Ultra-Thin Stainless. Byron R. Russell. *Welding Engineer*, v. 42, Mar. 1957, p. 38-39.

Stainless steel sheets 0.0005 in. thick are joined using automatic tungsten argon welding fixture.
(K1d; SS, 4-3)

178-K. Resistance Uses Are Limited Only by Imagination. Jack Fairlie. *Welding Engineer*, v. 42, Mar. 1957, p 44-48.

Spot and projection welding; their development, principles, uses and definitions. (K3n, K3q)

179-K. (French.) **The Use of Electric Arc Welding Processes for Mild Steels, With High Current Density, Under a Gas Shield.** A. Moreau. *Revue de la Soudure*, v. 13, no. 1, 1957, p. 1-11.

Possibilities and limitations of carbon dioxide shielded welding compared with the more expensive argon shielded process. New technique using eight to ten times the usual current density has been applied to the welding of aluminum, light alloys, stainless steels. Advantages include absence of solid flux, high speed of deposit, visibility of the arc and high quality of the joints. (K1d)

180-K. (French.) **New Process of Automatic Welding in a Carbon Dioxide Protective Atmosphere.** F. Danhier. *Revue de la Soudure* v. 13, no. 1, 1957, p. 12-22.

New process of automatic welding combining the high operating speed of a submerged arc with the ease in use and excellent mechanical properties of a continuous electrode wrapped with basic coating; composition of electrode coatings; tests made with various types of slag; description of welding process and outline of its possibilities. 6 ref.
(K1d)

181-K. (French.) **Results of Brittle Fracture Tests Considered From the Fabricator's Point of View.** F. Hebrant, H. Louis, W. Soete and A. Vinckier. *Revue de la Soudure*, v. 13, no. 1, 1957, p. 31-48.

Steel disks into which were introduced artificial defects were used in these tests. Examines influence of various factors, such as residual stress due to welding, location and nature of the defect, quality of the steel, type of joint welded; some tests were also made on sheets. (K9r; ST)

182-K. (French and German.) **International Specifications for Filler Materials in Braze Welding.** G. M. Blanc. *Journal de la Soudure*, v. 47, Mar. 1957, p. 61-66.

Specifications were commissioned by the International Institute of Welding in December 1955. Two documents have been produced, one containing specifications covering the determination of the characteristics of the metal deposited (melting temperature, operating conditions, mechanical tests) and the other producing specifications concerning the strength of the bond on steel, cast iron and other metals. Explains common German, French and English welding terms.
(K5, 15-11; SGA-f)

183-K. (French and German.) **Welding of Silicon-Manganese Bronze.** *Journal de la Soudure*, v. 47, Mar. 1957, p. 58-61.

Bronze containing 1% manganese, 3% silicon and 96% copper is currently employed in the manufacture of pressure vessels and apparatus for the chemical industry; description of the cleaning and preparation of sheets prior to welding; use of flux; method employed for both torch welding and arc welding; note on hard and soft soldering.
(K1, K2, K7, L12; Cu-s, *Si, Mn*)

184-K. (German.) **Welding in the Nuclear Industry.** F. W. Davis and E. B. LaVelle. *Schweissen und Schneiden*, v. 9, Jan. 1957, p. 5-12.

Welding in radioactive chemical processing plants; maintenance welding in atomic facilities. Welding processes; testing and inspection. 10 ref. (K general, W11, T29)

185-K. (German.) **Welding of Large and Thick Sections by the Electro-Slag Process.** W. Anders. *Schweissen und Schneiden,* v. 9, Jan. 1957, p. 12-24.

General data on a submerged-melt process: welding conditions; machinery and equipment; filling materials and fluxes; applications. 8 ref. (K1e)

186-K. (German.) **Welding in the Mining Industry.** H. Speich. *Schweissen und Schneiden,* v. 9, Jan. 1957, p. 24-29.

Growth of welding in the mining industry. Application of welding in underground and strip coal mining. Future welding requirements of the mining industry. 5 ref. (K general, W14)

187-K. How to Make Sandwich. E. J. Tangerman. *American Machinist,* v. 101, Mar. 25, 1957, p. 137-161.

Methods used by this country's major fabricators in forming, machining, sawing and grinding of aluminum, stainless steel and titanium honeycomb and in bonding with adhesives or brazing on sandwich assemblies of aircraft components; advantages of honeycomb structure. (K12, K8, G general; Al, SS, Ti, 7-9)

188-K. Pressure Welding in Practice. R. F. Tylecote. *British Welding Journal,* v. 4, Mar. 1957, p. 113-120.

Techniques used in preparation and welding of joints by pressure with and without external heating; examples of application of method in joining overlapping sheet material such as copper and aluminum and butt welding of bars, tubes and sections of steel. 21 ref. (K5, K2)

189-K. Aluminum Dip Brazing. Donald E. Wernz. *Machinery,* v. 90, Mar. 8, 1957, p. 541-544.

Wave guide and other complex fabrications joined by aluminum dip brazing. Details of work preparation, fixtures, work assembly and brazing. (K8n; Al)

190-K. Special Welding Techniques. Final Summary Report for 1954. Glenn L. Martin Co. *U.S. Atomic Energy Commission,* AECU 3174, Jan. 31, 1955, 41 p.

The flange-during-welding method was developed to consistently produce high-quality recrystallization welds. With the recrystallization method it is possible to weld reliable and reproducible joints of high strength which will not leak. A method in which preflanged tubes were welded to drilled headers was also found to give high-strength, leakproof connections. (K3)

191-K. Research and Development on the Welding of Aluminum Alloy Plate. J. J. Chyle and I. Kutuchief. A. O. Smith Corp. (Frankford Arsenal). *U.S. Office of Technical Services,* PB 111850, Jan. 1955, 69 p. $1.75.

Successful welding procedures were developed for restrained "H" test plates of 24S-T4 aluminum alloys. Sound, defect-free joints in the 1½-in. thick alloys were welded by the inert-gas tungsten-arc process and the consumable electrode inert-gas shielded metal-arc technique. (K1d; Al, 4-3)

192-K. Ultrasonic Soldering of Aluminum. J. B. Jones and J. G. Thomas. Aeroprojects Inc. (Frankford Arsenal). *U.S. Office of Technical Services,* PB 121551, Feb. 1955, 68 p. $1.75.

Successful application of ultrasonic soldering techniques to the difficult task of soldering aluminum. Factors significant to ultrasonic soldering, particularly the ultrasonic exposure time and soldering temperature relationships. Effects of joint configuration and filler metal thickness on joint strength. (K7h; Al)

193-K. Further Studies on Stainless Steel Hot Cracking. P. P. Puzak and H. Rischall. Naval Research Laboratory. *U.S. Office of Technical Services,* PB 121569, Nov. 1956, 12 p. $0.50.

Sporadic base-metal hot cracking and weld-metal hot cracking are generally encountered in the welding of heavy sections of the columbium-bearing Type-347 stainless steels. Results of this research support a hypothesis drawn from earlier studies that grain-boundary liquation is responsible for base-metal hot cracking. (K9n; SS, 9-22)

194-K. Joining of Molybdenum. W. N. Platte. Wright Air Development Center. *U.S. Office of Technical Services,* Technical Report 54-17, Pt. 3. Nov. 1956. (PB 121845) 85 p.

Using argon or helium permits little contamination in fusion-welding molybdenum. The use of high-purity argon shows little improvement over the welding grade. In-

creasing the carbon content of molybdenum in the range 0.4-0.6% improves weld ductility; the improvement of other mechanical properties by overaging and polygonization was studied. Removing nitrogen from the weld by diffusion and the effects of residual welding stresses were explored. (K1d, Q general; Mo)

195-K. Design and Technique Requirements for Arc Welding Titanium in Aircraft Applications. R. Meredith and B. L. Baird. *Welding Journal,* v. 36, Apr. 1957, p. 371-377. (CMA)

The benefits of using copper chill bars clamped on tightly in welding titanium. The weldability of titanium alloys is discussed: titanium and Ti-5Al-2.5Sn may be readily welded, Ti-3Mn-1Al and Ti-6Al-4V sheet may be welded with proper technique, and Ti-6Al-4V bar, Ti-3Al-5Cr and Ti-4Mn-4Al cannot yet be welded satisfactorily. Preweld cleaning and vacuum annealing, tooling considerations and design of butt, corner, "attach fitting", flange and special joints are also discussed. Accessibility should be provided for both sides of the joint after final assembly. (K1, T24; Ti)

196-K. Argon-Arc Welding and Post-Weld Treatment of an Aluminium-Magnesium-Zinc Alloy. W. T. Tyler, C. A. Terry and D. C. Moore. *Welding and Metal Fabrication,* v. 25, Mar. 1957, p. 82-90.

High-quality butt welds produced in annealed or heat treated alloy by both manual and automatic argon shielded tungsten arc processes; effect on mechanical properties and microstructure of use of filler wire containing titanium, hot working by rolling or hammering following welding or soaking at solution heat treatment temperature.
(K1d, K9q; Al, *Mg, Zn*)

197-K. (French.) **Application of Argon Arc Welding to the Construction of Light Alloy Cars.** G. Dupré. *Soudage et Techniques Connexes,* v. 11, Jan.-Feb. 1957, p. 29-38.

Survey of the reasons for the extensive application of inert-gas arc welding using a consumable electrode; description of preliminary tests and conclusions derived as regards the selection of the welding variables; examination of the structure of some prefabricated components and the butt welding of plates. Comparison between welding and riveting. (K1d; Al)

198-K. (French.) **Productivity in the Welding of Pipelines.** C. Deutsch. *Soudage et Techniques Connexes,* v. 11, Jan-Feb. 1957, p. 57-61.

Advantages of the transport by pipeline of hydrocarbons have been confirmed by developments regarding the specifications applicable to tubes, the fabrication of welded tubes and the construction of pipelines by welding; consideration of costs and applications. (K general; 4-10)

199-K. (German.) **Inquiry Into the Applicability of the Copper-Phosphorus Solder, L Cu P 8.** Erich Luder. *Neue Hütte,* v. 2, Jan. 1957, p. 18-23.

Properties of copper-phosphorus solder; measurement of working temperatures; structure determination of the bonds; tensile tests of soldered wires; brazing of steel, nickel, copper alloys; estimation of strength of bonds; measurement of the working temperatures as a means of flux estimation. (K8; Cu, SGA-f)

200-K. (Spanish.) **Quantity Production With Brazing.** G. M. A. Blanc and J. C. Charton. *Ciencia y Técnica de la Soldadura,* v. 7, Jan-Feb. 1957, 12 p.

Influence of modern brazing procedures on cost and productivity; relation of cost to fusion time for a number of filler metals; examples of brazed joints made with blowpipes, gas flame, furnace and high-frequency current as sources of heat. (K8)

201-K. (Spanish.) **Welding. Electric Arc Welding.** *Ciencia y Técnica de la Soldadura,* v. 7, Jan.-Feb. 1957, p. 33-36.

Includes end of Chapter V on Thermodynamic Emission and Chapter VI on Impact Ionization of Atoms of Gases. (To be continued.)
(K1, P12)

202-K. (Swedish.) **Welding or Casting.** B. Wetterström and E. Gladh. *Gjuteriet,* v. 47, Mar. 1957, p. 37-41.

Discussion by an engineer and a foundryman on the design of a 68-ton steam turbine casing. New developments in welding have made welding of such casings economical; however, there have also been important refinements in casting techniques. (K general, W11, 17-1)

203-K. Fundamentals of Glass-to-Metal Bonding: Pt. II. Reactions of Tantalum and Sodium Silicate Glass. Stephan P. Mitoff. *American Ceramic Society, Journal,* v. 40, Apr. 1957, p. 118-120.

The identification of a reaction product (sodium metaniobate) at the interface between a tantalum metal

and sodium silicate glass followed by thermodynamic calculations and finally testing of the calculations with further experimental evidence have been employed in this sequence to determine the most likely reaction occurring at high temperatures. (K11a; Ta)

204-K. How to Use Nickel-Manganese Brazing. R. A. Gustafson. *Industry and Welding,* v. 30, Apr. 1957, p. 82-87.

Nickel-manganese available in wire and powder forms gives better results than nickel-chromium alloys in brazing most types of steel, including stainless steel and cobalt-base alloys. (K8; SS, Co, SGA-f, Ni, Mn)

205-K. Successful Soft Soldering of Stainless Steels. *Industry and Welding,* v. 30, Apr. 1957, p. 76-78, and 116-117.

Steps in surface preparation, solder selection, design of joints and post joining operation cleaning. (K7; SS)

206-K. Sealing Metal and Ceramic Parts by Forming Reactive Alloys. J. E. Beggs. *Institute of Radio Engineers, Professional Group on Component Parts, Transactions,* v. 4, Mar. 1957, p. 28-31. (CMA)

Metal and ceramic parts may be sealed by inserting a thin sheet of metal that will form a reactive alloy. Titanium and copper or nickel can form such an alloy. If a shim of titanium is placed between the nickel or copper part and the ceramic part and then heated, eutectic alloys will form as indicated by the phase diagram shown. The amount of alloy which forms depends on shim thickness and the metals chosen. When the metal part is titanium it may be sealed with a nickel shim, or with solder. Metals such as molybdenum require two shims. The shim metal reacts also with the ceramic (zircon or alumina). The seals are capable of operation at high temperatures. (K11b; Ti, Mo, Cu, Ni)

207-K. Recent Advances in the Application of Resistance Welding to Airframe Construction. N. K. Gardner. *Institution of Production Engineers Journal,* v. 36, Apr. 1957, p. 238-252.

Examples of the use of spot, seam and resistance welding; design, control and inspection. 12 ref. (K3, T24a)

208-K. Distortion and Residual Stress in Welded Units. A. Lawless. *Mechanical World and Engineering Record,* v. 137, Apr. 1957, p. 159-163.

A summary of current practice examined in relation to a basic principle which enables an appreciation to be built up of the behavior of most structures during welding. Notes are included on some other workshop uses of controlled heat distortion. (K general, Q25k; 9-24)

209-K. How to Solder Stainless Steel. G. W. Hinkle. *Metal Products Manufacturing,* v. 14, Apr. 1957, p. 64-65.

Brief notes on preparation of stainless steel surfaces and selection of solder for making the best joint. (K7; SS)

210-K. Hand Soldering and Brazing. *National Safety News.* v. 75, Apr. 1957, p.34-40.

Brief notes on soldering methods such as electric iron soldering, gas-heated iron soldering, dip tinning and torch soldering. (K7, K8)

211-K. Welding Light-Gauge Mild Steel. C. R. Thatcher. *Sheet Metal Industries,* v. 34, Apr. 1957, p. 263-266.

An account of arc welding practices at Frigidaire Division of General Motors. (K1; CN, 4-3)

212-K. Brazing Stainless Steel Honeycombs. G. Jewett Crites. *Steel,* v. 140, Apr. 8, 1957, p. 92-94.

Outlines brazing alloys and several methods. Retort most widely used but vacuum furnace brazing shows considerable promise. (K8, 1-23; SS, 7-9)

213-K. Welding and Brazing Refractory Metals. Pt. I. F. G. Cox. *Steel Processing and Conversion,* v. 43, Mar. 1957, p. 147-152. (CMA)

Use of the fabricated part is the major consideration in choosing the joining method for zirconium, molybdenum and other refractory metals. Sheet thickness is an important criterion for most methods. Zirconium sheet thinner than 0.015 in. can be suitably welded by resistance methods and not by argon arc methods. The reverse is true above that gage. Argon or vacuum is necessary for brazing. Molybdenum in all gages can be brazed by five methods and can also be resistance welded, but argon-arc welding is unsatisfactory. (K1, K3, K8; Zr, Mo)

214-K. Discussion of the Design of Riveted and Bolted Joints in Titanium Sheet. S. A. Gordon. Battelle

Memorial Institute, Report 35. *U.S. Office of Technical Services,* PB 121611, Feb. 1956, 31 p. (CMA)

A number of zirconium alloys were studied. Additives include molybdenum, tantalum, tungsten, tin, titanium and nitrogen. All but tungsten increase the high-temperature tensile strength. Tin and molybdenum increase the corrosion resistance. Some proportion of all additives except nitrogen form solid solutions and are not amenable to improvement by heat treatment.
(K13n, K13p, Q27a, R general, 2-12, 1-10, Zr)

215-K. Welding of Titanium and Titanium Alloys. G. E. Faulkner, W. J. Lewis, M. L. Kohn and P. J. Reippel. Battelle Memorial Institute, Report 31. *U.S. Office of Technical Services,* PB 121609, Feb. 1956, 82 p. (CMA)

Literature survey of welding of titanium and titanium alloys is presented with technical journal and government and industry research reports used as sources. Welding procedures are discussed. Mechanical properties of welded joints in titanium are always affected by impurities but high-purity joints are ductile and arc welded butt joints have properties like those of base metal. Methods of evaluating mechanical properties in weld joints are described. (K general; Ti)

216-K. Automatic Weld Set-Up Eliminates Distortion in Stainless Screws. F. T. Tancula. *Welding Engineer,* v. 42, Apr. 1957, p. 39-40.

Conveyor screws of Type-316 stainless steel automatically arc welded using argon shielding gas (MIG process). (K1d, T7; SS)

217-K. Automatic Tig Welding of Aluminum Fuel Tanks. J. R. McFarland and H. S. Davis. *Welding Engineer,* v. 42, Apr. 1957, p. 41.

Procedure in welding tanks for jet-propelled missiles. (K1d; Al)

218-K. Versatility and Economy. Pt. 2. Factors That Favor Acetylene. J. Okladek. *Welding Engineer,* v. 42, Apr. 1957, p. 52-54.

Data on acetylene and propane used as cutting and welding fuels. Radiation transfer, oxygen consumption and other factors favor acetylene. (K2h)

219-K. Arc Welding Defined. Pt. 2. Consider Loading When Selecting Joint Design. Bela M. Ronay. *Welding Engineer,* v. 42, Apr. 1957, p. 55-57.

Basic essentials in designing joints to be welded, including consideration of amount and nature of load; prevention of unfused centers, good end preparation and fit-up. (K1, 17-1)

220-K. Invaluable Welds for the Auto Industry. John F. Cantalin. *Welding Engineer,* v. 42, Apr. 1957, p. 62-67.

Description of roller spot welder used in joining automobile roof flange to drip-molding. (K3n; T21)

221-K. How to Estimate Electrode Consumption (Manual or Automatic). *Welding Engineer,* v. 42, Apr. 1957, p. 95-96.

Charts for calculating approximate amounts of electrodes used for all joints. (K1)

222-K. Technology of Arc Welding of Light-Gage Sheet Steel in a Carbon Dioxide Atmosphere. F. E. Tret'yakov. *Henry Brutcher Translation* no. 3779, 3 p. (From *Svarochnoe Proizvodstov,* no. 5, May 1956, p. 20-22.) Henry Brutcher, Altadena, Calif.

Previously abstracted from original. See item 323-K, 1956.
(K1, AY, SS)

223-K. (French.) **English Production of Welding Equipment.** *Metallurgie et la Construction Mecanique,* v. 89, Mar. 1957, p. 243-247.

Gas-cutting apparatus; welding stations; electrodes; weld control and inspection. (K general, 1-2)

224-K. (French and German.) **Fresh Light on Phenomena in Inert-Gas-Shielded Arc Welding With Fusible Electrodes.** B. Keel. *Zeitschrift für Schweisstechnik,* no. 4, Apr. 1957, p. 86-89.

Analysis of the various factors involved in electrode activation; emissive potentials of various base metals; theory that by the addition of activating agents the distribution of heat in the electric arc can be regulated. (K1d)

225-K. (French and German,) **International Specifications for Filler Metals in Braze Welding.** G. M. Blanc. *Zeitschrift für Schweisstechnik,* no. Apr. 4, 1957, p. 97-99.

Determination of the adhesive characteristics on cast iron; types of assembly and choice of filler metal; operating conditions; mode of operation; testing; determination of the adhesive characteristics on metals other than cast iron and steel.
(K 8, S22)

226-K. (German.) **Sheet Construction of the "Sandwich" Type.** E. W. Pleines. *Metall,* v. 11, Mar. 1957, p. 209-216.

Components of a sandwich structure are two fairly thin parallel or concentric "face", or "cover plates", with a relatively thick "core material" or "filler" which is cemented to the two cover plates. The filler can be a honeycomb, a corrugated sheet, a foam or a fiber material. Description of different applications. (K11; 7-9)

227-K. (German.) **Testing Weldability.** P. Bettziehe. *Schweissen und Schneiden,* v. 9, Mar. 1957, p. 91-93.

Factors influencing weldability and possibilities of reducing the tendency to brittle fracture. 12 ref. (K9s, Q26s)

228-K. (German.) **Increase of Strength of Soldered Joints by Decreasing the Slot Width Is Manifested as Strength Through Inhibited Deformation.** Hans Bühler and Jacob Colbus. *Zeitschrift für Metallkunde,* v. 48, Feb. 1947, p. 66-71.

With solders (Armco-iron, tin and lead) at a slot width of zero, the extrapolated values of the strength of the soldered joint depends upon the cohesive strength of the solder. The increase in strength is also dependent upon changes in the condition of stress. 20 ref. (K7; Fe, Sn, Pb, SGA-f)

229-K. (Italian.) **Nickel and High-Nickel Alloys for Pressure Vessels. Pt. III.** *Il Nickel,* no. 66, Feb. 1957, p. 7-15.

Types of welding suitable for pressure vessels; brazing; joining dissimilar metals; inspection. (Concluded.) (K general, T26q; Ni)

230-K. (Italian.) **Study on Automatic Submerged Arc Welding.** Antonio Lo Giudice. *Ingegneria Meccanica,* v. 5, Feb. 1956, p. 5-13.

Study conducted to establish limits of applicability of this technique to bodies subjected to pressure and tested by radiographic and mechanical means. (K1e)

231-K. (Italian.) **Pipe Welding. Pt. IV.** Carlo Losito. *Rivista di Meccanica,* no. 150, Dec. 1, 1956, p. 17-22.

Defects, corrective measures. (K general; 4-10, 9)

232-K. (Spanish.) **Definitions and Recommendations Dealing With Brazing, Soldering and Welding With Bronze.** *Ciencia y Técnica de la Soldadura,* v. 7, Jan-Feb. 1957, 2 p.

Document 1-34-56 issued by Commission on Gas Welding and Allied Processes of International Institute of Welding. English, French, German and Spanish terms for wetting, spreading, flowing and strength of bond. (K7, K8, 11-17)

233-K. (Pamphlet—Multilingual.) **Multilingual Collection of Terms for Welding and Allied Processes.** Prepared by International Institute of Welding and published with financial assistance of UNESCO. 132 p. 1955. Société Suisse de l'Acetylene, Basel, Switzerland. $8.

General terms, welding procedure, characteristics and inspection of welds. In Danish, Dutch, English, Finnish, French, German, Italian, Norwegian, Serbo-Croatian, Slovenian, Spanish, Swedish. (K general, 11-17)

234-K. (Book.) **Symposium on Solder.** Fred F. Van Atta. 190 p. Apr. 18, 1957. American Society for Testing Materials, ASTM Special Technical Publication STP 189. $3.

Vital role of fluxes, solder compositions and applications in attaining satisfactory service performance of soldered joints. Covers manual, mechanized and ultrasonic techniques of soldering, and emphasizes the role of standardization in solder technology. A unique system is presented for evaluating fluxes, solder alloys and solderability in numerical terms. (K7; SGA-f)

235-K. (Italian.) **Comparative Study of Welding Practices in Europe. Notes on O. E. E. C. Mission-EPA 250 (4-15-55, 5-16-55).** Antonio Lo Giudice. *Ingegneria Meccanica,* v. 5, Dec. 1956, p. 43-46; v. 6, Jan. 1957, p. 33-39.

Pt. 1. Major industrial plants of Western Europe in which welding is of special importance were visited. This report, edited by a delegate of the Italian government, is intended to give a picture of welding methods, preparation practices; types of steel welded, design standards, consumption of steel and electrodes, etc., in countries visited. Pt. 2. Practices and equipment in English, Norwegian, Swedish, Danish, Dutch plants. (To be continued.) (K general)

236-K. **Condenser Tubes Are Welded.** R. A. Wilson and W. W. Edens. *Electrical World,* v. 147, Apr. 22, 1957, p. 57-58.

Tungsten inert gas welding was found to be best, especially when

an over-riding high-frequency arc current initiates the arc and starts the weld. Naval brass tube sheets and admiralty metal tubes are joined. (K1d; Cu, 4-10)

237-K. Welding of Steam and Feed Pipework for Marine Installations. J. Chamberlain and W. L. Roe. *Welding Research Abroad,* v. 3, Mar. 1957, p. 29-38.

Suitability of certain types of steel for specific steam temperature ranges; types of welded joints and preparation of tubes for welding; filler rods and electrodes; preheating; post-welding heat treatment; nondestructive examination; repairs to faulty welds. 8 ref. (K general, T22, 17-7; ST, 4-10)

238-K. (French.) **Contribution to the Study of the Control of the Voltage, Strain, Time Parameters in Resistance Spot Welding.** M. Evrard and C. Haslé *Soudage et Techniques Connexes,* v. 11, Mar-Apr. 1957, p. 69-75.

Method based essentially on the use of a stylus-type oscillograph, the measuring gear of which is connected to various devices for the determination of the welding parameters. The simultaneous recording and direct examination of the curves obtained permit an efficient control of the spot welding operation. (K3n, 1-2)

239-K. (French.) **Welded Framework of the Boulogne-Billancourt Skating-Rink.** P. Lorin. *Soudage et Techniques Connexes,* v. 11, Mar-Apr. 1957, p. 76-81.

Details of design and construction. The whole structure contains 3800 m. of electrically welded beads for which basic coated electrodes were used. (K1a, T26n, 17-7; ST)

240-K. (French.) **Use of Superficial Colorations Produced by Hot Oxidation as a Nondestructive Testing Method in Spot Welding.** P. Joumat. *Soudage et Techniques Connexes,* v. 11, Mar-Apr. 1957, p. 93-99.

Method used for ascertaining the efficiency of heat treatments under electrode tips without destroying the spot welds. Emphasizes the relationship between colorations, hardness and torsional characteristics of spot welds and notes the effect of metal analysis and several welding and dispersion factors. In its present form the method facilitates setting operations and makes it possible to check setting adequacy in the course of industrial fabrication. (K3n, K9r)

241-K. (French.) **Productivity of Brazing.** G.M.A. Blanc and J. C. Charton. *Soudage et Techniques Connexes,* v. 11, Mar-Apr. 1957, p. 111-118.

Influence of modern brazing procedures on cost and productivity. The total cost of an assembly can be reduced by using a high-quality filler metal, notwithstanding its higher unit price. Various examples of application of oxy-acetylene, gas flame, oven and high-frequency brazing are given. Emphasizes the great versatility of brazing. (K8; SGA-f)

242-K. (German.) **Maintenance and Repair of Parts and Components by Means of Welding. Pt. I.** Herbert Neumann. *Schweissen und Schneiden,* v. 9, Apr. 1957, p. 138-146.

Welding of joints for locomotive and ship boilers, drive and brake components, wheels, couplings, pipes and castings; application of various types of electrodes; flash-butt welding; automatic welding. (K general, 18-21, 18-22)

243-K. (German.) **Automatic Carbon-Dioxide Shielded Arc Welding With Slag Covering.** C. de Rop and H. Schmidt-Bach. *Schweissen und Schneiden,* v. 9, Apr. 1957, p. 146-150.

Working principle of the automatic welding machine; welding operation; design of the Falz electrode; mechanical properties of the weld metal; melting rates. 4 ref. (K1d, 1-2)

244-K. (German.) **Acceptance Rules for Chains Made From Round Steel Bar Material.** Rudolph Overlach. *Schweissen und Schneiden,* v. 9, Apr. 1957, p. 150-155.

Anchor chains for ships; chains for mining, hoists, scaffolding, structural engineering purposes; foreign standards for chains; present position of acceptance rules for chains with regard to welding. (K9r, T7e, 17-7; ST)

245-K. (Italian.) **Arc Welding in Atomic Hydrogen Atmosphere.** Lelio Orsini. *Macchine,* v. 11, Mar. 1957, p. 257-259.

Equipment, technique, advantages, applications. (K1d, 1-2)

246-K. Inert Gas Shielded Welding of Aluminum Bronze. P. C. Greene. *Bureau of Ships, Journal,* v. 5, Apr. 1957, p. 11-12.

Advantages and disadvantages of non-nickel-bearing wrought aluminum bronze plate; spectrographic method of detecting cracks caused by welding. (K1d, S13d; Cu, *Al*)

247-K. Ultrasonic Metal Joining. J. Byron Jones and E. E. Weismantel.

Electrical Manufacturing, v. 59, Apr. 1957, p. 125-129, 316.

Ultrasonic energy is being used in soldering, brazing and welding. These processes are particularly applicable to specialized joining problems in electrical design. Improved joint reliability is achieved through elimination of flux, and cost savings can be effected by substituting aluminum for copper in electrical assemblies. (K6, K7h, K8, 1-24)

248-K. Testing of Welding Metal With Special Reference to the Control of South African Bureau of Standards Approved Electrodes. J. W. Swardt. *Engineer and Foundryman,* v. 21, Feb. 1957, p. 41-45.

Brief comment on impact resistance tests, usability tests and interpretation of radiographs. (K9r)

249-K. Welding Distortion Problems Encountered in the Gas Turbine Industry. S. A. Onions. *Institution of Production Engineers, Journal,* v. 36, Mar. 1957, p. 193-199.

Causes of weld distortion and the economic and technical difficulties involved in its correction. (K9n)

250-K. How to Solder Stainless Steel. *Marine Engineering Log,* v. 62, May 1957, p. 70-71.

Preparation of surface, selection of solder and finishing of stainless steel soldered joints. (K7; SS)

251-K. Canada to Get New Welding Process. *Modern Power and Engineering,* v. 51, Mar. 1957, p. 120-121.

A new process for the welding of carbon steel; semi-automatic metal arc welding process, using a continuously fed bare wire, powdered magnetic flux, and carbon dioxide gas. (K1d; CN)

252-K. Welding Processes Described. *Oil and Gas Journal,* v. 55, Apr. 8, 1957, p. 129-132.

Application of submerged arc, inert arc and resistance welding. 3 ref. (K1d, K1e, K3)

253-K. Remote Welding of Stainless Steel Containers. E. E. Pierce. Oak Ridge National Laboratory, *U.S. Atomic Energy Commission,* ORNL-2280, Apr. 22, 1957, 8 p.

Equipment for sealing stainless steel cylinders containing radioactive materials by remotely operated shielded-arc welding has been fabricated and successfully operated. The equipment consists of two portable units. One of the units, including a rotating chuck and electrode positioner, is operated in a cell equipped with model-8 master-slave manipulators. The power supply unit and control panel are of conventional design and are operated outside the cell. (K1d, W12a, 1-2; SS)

254-K. (Italian.) **Comparative Study of Welding Practices in Europe. Notes on O.E.E.C. Mission EPA 250 (4-15-55, 5-16-55). Pt. III.** Antonino Lo Giudice. *Ingegneria Meccanica,* v. 6, Feb. 1957, p. 17-24.

Practices and equipment in German, Belgian, Austrian and Swiss plants. (To be continued.) (K general)

255-K. (Italian.) **Welded Structures. Criteria and Standards of Design and Execution.** G. P. Perego. *Rivista di Meccanica,* no. 155, Feb. 16, 1957, p. 19-24.

Welded joints; types of joints and placement of welds; oxy-acetylene and electric arc welding procedures. (To be continued.) (K1, K2, S22, 17-1)

256-K. (Pamphlet—German.) **Qualitative Examination of Spot Welded Joints on Deep Drawn Aluminum Sheets, Produced With the Argon-Shielded-Arc Spot Welding Method.** K. Krekeler and H. Verhoeven. Forschungsberichte des Wirtschafts-und Verkehrsministeriums Nordrhein-Westfalen, no. 275, 1956, 52 p. Westdeutscher Verlag, Ophovener Strasse 1-3 Opladen, West Germany. DM 14-60.

Starting materials, influence of various factors during the process, practical applications, metallographic examination. 7 ref. (K3n; Al, 4-3)

257-K. Recommended Welded Connections for Pressure Vessels. *British Welding Journal,* v. 4, Apr. 1957, p. 174-180.

Recommendations for manually welding connections in carbon steel pressure vessels by metal-arc processes; from commission on pressure vessels, boilers and pipelines of the International Institute of Welding. (K1, T26q; CN)

258-K. Effect of Impurities in Argon on Inert-Gas Shielded-Arc Welds. R. A. Cresswell. *British Welding Journal,* v. 4, Apr. 1957, p. 181-188.

Investigates effect of presence of nitrogen, oxygen, hydrogen and water vapor in the argon for gas shielding in the arc welding of

commonly used materials by both tungsten argon arc and consumable electrode processes. Materials welded were aluminum, aluminum-magnesium alloys, magnesium, copper, stainless and mild steel. 2 ref. (K1d, 3-19; Al, Mg, Cu, SS, CN)

259-K. Summary of Recent Work on the Murex Hot-Cracking Test. P. W. Jones. *British Welding Journal,* v. 4, Apr. 1957, p. 189-197.

Work aimed at finding best testing conditions assessing capabilities of Murex hot-crack machine and tests; results of test carried out with 24 different brands of electrodes in attempt to find factors promoting or mitigating hot-cracking. Notes on effect of sulphur. 2 ref. (K9r, W29h, 1-2)

260-K. Is Welding Ready for High Alloys. H. J. Nichols. *Canadian Metals,* v. 20, Apr. 1957, p. 36-38.

Problems and requirements in welding high-strength steels for fabrication of pressure vessels. (K general, T26q, 17-7; ST, SGA-a)

261-K. Magnesium Alloy Castings: Heat Treatment After Welding Repairs. K. Kronfeld. *Canadian Metalworking,* v. 20, May 1957, p. 54-61.

Test samples of unwelded AZ91 castings were compared with test pieces having approximately 20% of their cross-sectional areas occupied by an inert-gas welded deposit of identical composition. 33 ref. (K1d, J general, 18-22; Mg)

262-K. How to Silver Braze Powdered Metal Parts. *Industry and Welding,* v. 30, May 1957, p. 50-51.

Note on use of colloidal graphite to prepare sintered metal powdered parts for silver brazing. (K8; 6-22)

263-K. Shorthand of Welding. Clement F. Brown. *Industry and Welding,* v. 30, May 1957, p. 98-100.

Table of welding symbols for indicating simple butts and fillet welds on drawings. (K general, 17-1)

264-K. Basic Facts on Resistance Welding. P. M. Howard and D. Wilcox. *Industry and Welding,* v. 30, May 1957, p. 57-59, 113.

Theory of resistance welding and relation of weld defects to electrical resistivity; thermal conductivity of metal, weld pressure, current and time. (K3)

265-K. Strength of Silver Brazed Joints in Mild Steel. W. G. Moffatt and J. Wulff. *Journal of Metals,* v. 9, *AIME Transactions,* v. 209, Apr. 1957, p. 442-445.

Experimental data for pure silver brazed joints in SAE 1020 steel indicate that for cylindrical test specimen with transverse joint ultimate tensile strength is linear function of joint thickness-to-diameter ratio. (K8, Q27a; CN)

266-K. How to Make Machinable Welds in Cast Iron. *Machinery,* v. 63, May 1957, p. 160-161.

Procedure for cleaning, joint preparation, preheating, welding, peening for stress reduction and post heating. Suggests use of nickel or nickel iron electrodes. (K9, K1; CI, 18-22)

267-K. Operations on Body Components for Ford Consul, Zephyr and Zodiac Cars. *Machinery,* v. 90, Apr. 26, 1957, p. 908-918.

Resistance welding equipment and operations used for assembling automobile doors. (K3, 1-2)

268-K. For Better Brazing Start With the Fundamentals. Lester F. Spencer. *Tooling and Production,* v. 23, May 1957, p. 99-103.

Defines brazing; gives data and examples on silver brazed joints comparing joint strength to strength of metals being joined; suggestions on cleaning, fluxing and heating for silver brazing. (K8; *Ag*)

269-K. Teaching Welders How to Maintain Manganese Frogs. *Track and Structures,* v. 53, May 1957, p. 48-51.

The welding and care of manganese steel. (K general, A3h; AY, *Mn*)

270-K. Repair of a Cast Iron Machine Side-Frame. L. Miller. *Welding and Metal Fabrication,* v. 25, Apr. 1957, p. 131-132.

Procedure and precautions in the repair of a large cast iron frame by oxy-acetylene welding using cast iron filler rod. (K2h, 18-22; CI)

271-K. Nicrobraze Applied to the Napier "Eland" Gas Turbine. K. A. Peel. *Welding and Metal Fabrication,* v. 25, Apr. 1957, p. 137-143.

Atmosphere control and method of heating for brazing with Nicrobraze, a nickel-chromium-boron alloy. Data on mechanical properties for joints of steel or nickel alloys at high temperatures and after prolonged exposure at high temperatures; use of brazing procedure in fabrication of turbo-prop engine parts. (K8; ST, Ni, SGA-f)

272-K. Welded Aluminum Alloy Fishing Boat. *Welding and Metal Fabrication,* v. 25, Apr. 1957, p. 144-148.

Description of inert-gas, shielded metal-arc welding and tungsten argon-arc welding of aluminum fishing boat giving operational details on type of joint, current, gas flow and welding time. (K1d, T22; Al)

273-K. Resistance Types With Valuable Industrial History. Jack Fairlie. *Welding Engineer,* v. 42, May 1957, p. 37-38.

Note on welds achieved and equipment used for seam and for flash butt welding processes.
(K3p, K3r, 1-2)

274-K. How to Estimate Electrode Consumption. *Welding Engineer,* v. 42, May 1957, p. 83.

Table for calculating weight of electrode consumed per linear ft. for all 90° welds. (K1, W29h, 1-2)

275-K. Strength of Brazed Joints in Copper Alloys. *Welding Journal,* v. 36, Apr. 1957, p. 177s-148s.

Room-temperature strength of lap and butt-type joints in copper alloys, brazed with various filler metals, is determined through laboratory investigation. 10 ref.
(K8, Q27a; Cu)

276-K. Studies of Upset Variables in the Flash Welding of Steels. E. F. Nippes, W. F. Savage, G. Grotke and S. M. Robelotto. *Welding Journal,* v. 36, Apr. 1957, p. 192s-216s.

Influence of temperature gradient prior to upset, upset current density and composition of material on the upset behavior determined for three steels of differing elevated-temperature strength. (K3r; ST)

277-K. Application of Inert-Gas Tungsten-Arc Welding to Carbon-Steel Pipe. F. J. Pilia and R. W. Minga. *Welding Journal,* v. 36, Apr. 1957, p. 363-370.

New welding techniques and procedures, discussion of joint design, operator training and economics of application. (K1d; CN, 4-10)

278-K. Development of Methods for Sealing Ends of PWR Fuel Rods. J. J. Vagi and D. C. Martin. *U.S. Atomic Energy Commission,* BMI-942. Aug. 16, 1954. 30 p. (CMA)

Methods for sealing the ends of uranium (12% Mo) fuel rods clad with Zircaloy-2 were studied. Resistance upset welding is the most promising method for end capping, but gas porosity and shrinkage cavities remain a problem. Vacuum treatment helps porosity. Intergranular voids could be caused by either the welding or the polishing technique. Pressure bonding the end seals on a spot welding machine shows some promise. Flash welding and percussion welding were eliminated because the molten core is extruded.
(K3, K5k, T11g, 17-7; U, Zr)

279-K. Automatic Argon Arc Welding of Stainless Steels With Consumable Electrodes in Various Positions. A. N. Akulov and N. Yu. Pal'chuk. *Henry Brutcher Translation* No. 3906, 3 p. (From *Svarochnoe Proizvodstvo,* no. 6, June 1956, p. 27-29.) Henry Brutcher, Altadena, Calif.

Previously abstracted from original. See item 407-K, 1956. (K1; SS)

280-K. (French and German.) **Welding of Cast Iron.** Curt Elster. *Zeitschrift für Schweisstechnik,* v. 47, May 1957, p. 112-119.

Technical and economic possibilities of this little known process. Factors involved, methods employed, quality control and applications of "cold" arc welding. (To be continued.) (K1; CI)

281-K. Adhesive Bonding of Magnesium. R. J. E. Hunter. *Aircraft Production,* v. 19, May 1957, p. 198-201.

Process incorporating a corrosion resistant hot alkaline chromate treatment as the surface preparation, and intended for service at elevated temperatures. (K12; Mg)

282-K. How Grumman Welds Fusion to Non-Fusion Aluminum. John P. Wright. *American Machinist,* v. 101, June 3, 1957, p. 104-105.

Leading-edge wing tanks are resistance welded from fusion and nonfusion weldable aluminum through a method developed by Grumman Aircraft Engineering Corp. (K3; Al)

283-K. Dielectric Heat Cooks Metal Sandwiches. Don W. Cole. *American Machinist,* v. 101, Apr. 22, 1957, p. 153-156.

Possibilities and suggested setups for use of dielectric heat to cure plastic bonding materials in joining metal to metal assemblies.
(K12, 16-11)

284-K. Three Cantor Lectures, Lecture II. H. G. Taylor. *British Pe-*

troleum Equipment News, v. 5, Spring 1957, p. 68-75.

Deals with the welding of structural steelwork, bridges, tubular steelwork, pressure vessels, wind tunnels and excavators, and welding applications in the fields of atomic energy and oil refining. (To be concluded.)
(K general, T26, T29n, T11)

285-K. Survey of Brazing Alloys Cured Production Headache. *Canadian Machinery,* v. 68, May 1957, p. 162.

Brazing four bronze components of different gage to form a vibration-resistant hose part.
(K8; SGA-f)

286-K. Arc Welding Steel Castings. *Canadian Welder,* v. 48, May 1957, p. 6-8.

Preparation, thermal stresses, hot and cold cracking, porosity, suitable electrodes and post-weld treatments. (K1; ST, 5)

287-K. Welding Saves Steel. D. S. Desai. *Institution of Engineers (India) Journal,* v. 37, no. 7, Pt. 1, Mar. 1957, p. 695-705.

Savings of steel by means of welding are elimination of rivets, more compact joints, more freedom of design, reduces corrosion and eliminates overlapping joints.
(K general, A11; ST)

288-K. Guide to Better High-Temperature Brazing. W. Feduska. *Iron Age,* v. 179, May 16, 1957, p. 116-118.

To be considered in choosing brazing alloy are melting temperature, wettability, oxidation and corrosion resistance; also important in obtaining sound joints are heating rate, atmosphere control, joint interface and surface. (K8; SGA-f)

289-K. How to Join Magnesium Alloys. *Modern Metals,* v. 13, Apr. 1957, p. 42-47.

Recommendations and information on weld characteristics of alloys; arc welding techniques; repair welding of castings; stress-relief heat treatment; spot, seam and flash washing; weld inspection; adhesive bonding and mechanical joining.
(K general; Mg)

290-K. Corrugating Process Makes Flexible Cable Sheath. E. A. Farrell. *Modern Metals,* v. 13, Apr. 1957, p. 72-76.

Corrugated sheathing process developed and patented by German company, produces flexible aluminum sheath for electrical or communication cables which will take sharper bend and uses thinner gage metal. (K13a; Al)

291-K. Three Joining Methods for High-Temperature Sandwich Construction. A. A. Lanzara. *SAE Journal,* v. 65, May 1957, p. 62-64.

Brazing, adhesive bonding and resistance welding. (K8, K12, K3; 7-9)

292-K. How to Braze Aluminum. *Steel,* v. 140, Apr. 29, 1957, p. 164-167.

Lists brazable aluminum alloys, filler metals, flux and furnace dip, torch, induction and block brazing procedures, pretreatment for brazing aluminum to other metals.
(K8; Al)

293-K. New Fusion Methods Ease Joining of Hard-to-Weld Materials. C. B. Robinson. *Western Metals,* v. 15, May 1957, p. 54-56.

Tungsten inert-gas arc welding, tungsten inert-gas spot welding, and metal inert-gas welding are among newer welding processes for joining of titanium, aluminum, copper, zirconium, stainless and other alloys with special joining problems.
(K1d, K3n; Ti, Al, Cu, Zr, SS)

294-K. (German.) **Progress in Technology and Equipment of S.I.G.M.A. Welding.** E. Witting. *Aluminium,* v. 33, June 1957, p. 372-376.

General description of shielded-arc (S.I.G.M.A.) welding; special advantages and difficulties of shielded arc welding with consumable electrodes. Welding under a shield of pure argon containing 1% oxygen is quite a new means of improving weld quality and avoiding porosity. Description of automatic argon-arc cutting for preparation of edges for automatic S.I.G.M.A. welding.
(K1d, G22h)

295-K. (Portuguese.) **Influence of Hydrogen in Voltaic Arc Welding. "Fish Eyes" and Hot Cracking.** Victor E. de Strasser. *ABM-Noticiario,* v. 11, Apr. 1957, p. 2-4.

Causes of imperfections and methods of preventing their appearance.
(K1, g-22)

296-K. Japanese Process for CO_2 Shielded-Arc Welding of Steel. H. Sekiguchi and I. Masumoto. *British Welding Journal,* v. 4, May 1957, p. 205-212.

Tests show that welds made on rimming steel, semikilled or killed steels have good mechanical properties and low hydrogen content; process uses carbon dioxide or a car-

bon dioxide-oxygen mixture as a shielding gas with bare wire electrodes containing suitable quantities of deoxidants such as silicon, manganese and other elements; trial applications of process have begun in Japan. 6 ref. (K1d)

297-K. New Methods of Testing Weldability. M. K. Shorshorov. *British Welding Journal,* v. 4, May 1957, p. 239-243.

Three methods used in the USSR include a bead test to investigate changes caused by thermal cycle during welding and to establish best welding conditions; a method similar to Murex test for quantitative evaluation of hot cracking tendency; and a third method simulating weld thermal cycle in which samples are heated by electric current and artificially cooled enables the study of kinetics of grain growth and structural transformations — this technique was applied to several grades of carbon and low-alloy steels. 4 ref. (K9s, 1-4; CN, AY)

298-K. Solar Welds Electronically. Gordon Parks. *Industry and Welding,* v. 30, June 1957, p. 66-70.

Note on tungsten-arc argon-shielded, metal-arc argon-shielded, and other electronically controlled welding machines used at Solar Aircraft for automatic welding of aluminum and stainless steel airplane parts. (K1d, 1-2)

299-K. Brazing Helps Build Rockets and Missiles. G. Jewett Crites. *Industry and Welding,* v. 30, June 1957, p. 113-117.

Advantages of stainless steel honeycomb as structural material; retort, hot wall vacuum, cold wall vacuum, induction, electric blanket, blow torch, radiant lamp and salt bath brazing methods; their advantages and limitations in brazing honeycomb. (K8; 7-9)

300-K. Inert Gas Consumable Electrode Welding Process. D. B. Tait. *Metal Industry,* v. 90, May 3, 1957, p. 364-368.

Principles and development of process and its application in welding aluminum, copper, nickel alloys, stainless and mild steel. Properties of welds compared to those made by other processes. (K1d)

301-K. Regulated and Programmed Resistance-Welding Control Systems. C. Sinclair and F. S. Parker. *Welding Journal,* v. 36, May 1957, p. 463-465.

New current regulator for adjusting current on changes in impedance due to varying influence of magnetic material being welded can be programmed by a slope control to give regulated slope current wave, resulting in more accurate control over total heat delivered to weld during short weld times of spot or seam welding. (K3, W29c, 1-2)

302-K. Developed Procedures for the Flexible Electrode Submerged-Arc Welding Process. M. H. Fritsche. *Welding Journal,* v. 36, May 1957, p. 466-474.

Influence of fluxes and straight and reverse polarity on rate of weld metal deposition and mechanical properties; data on longitudinal and transverse shear strengths of fillet welds; comparison with other manual processes. 5 ref. (K1e, K9r)

303-K. Manual Magnetic Flux Gas-Shielded Arc Welding of Mild Steel. N. Davis and R. T. Telford. *Welding Journal,* v. 36, May 1957, p. 475-480.

Technique and equipment for manual arc process for all-position welding of mild steel; uses bare-steel welding wire, magnetic flux and carbon dioxide shielding gas. 4 ref. (K1d; CN)

304-K. Aspects of Crack Sensitivity in Machinable Deposits on Cast Iron. R. D. Wasserman, J. F. Quaas and J. P. Broderick. *Welding Journal,* v. 36, May 1957, p. 481-488.

Investigation of crack resistivity of welds made on cast test blocks, designed so that stresses cannot be dissipated; various nickel, iron-nickel and copper-weld metal ratios are explored; microstructure study and cross section hardness survey made of weld and cast iron base materials. (K9r; CI, 9-22)

305-K. Tip-Life Studies in the Spot Welding of 5052 Aluminum Alloy. Richard A. Davis and Robert C. McMaster. *Welding Journal,* v. 36, May 1957, p. 235s-239s.

Study of the effect of tip force on life and comparison of 4-in. and 10-in. radius dome electrodes. (K3n; Al)

306-K. Automatic Heliarc Speeds Seam Weld on Varied Size Stainless Pipe. Howard E. Jackson. *Western Metals,* v. 15, Apr. 1957, p. 66-67.

Forming and automatic arc welding of stainless steel tubing and pipe. (K1d; SS, 4-10)

307-K. (Danish.) **Automatic Submerged Arc Welding. Pt. I.** Bergstrand Poulsen. *Ingenioren,* v. 66, Jan. 26, 1957, p. 122-127.

Welding with continuous electrode feed. (K1e)

308-K. (German.) **Brazing of Pig Iron.** *Giesserei-Praxis,* v. 75, May 25, 1957, p. 222-223.

A practical discussion of brazing with emphasis on composition of fluxing material, flame temperature, oxygen supply and various other factors resulting in strong joints. (K8; CI-a)

309-K. (German.) **Light-Gage Sheet Steel Welding.** H. Verhoeven. *Industrie-Anzeiger,* v. 79, Mar. 12, 1957, p. 317-321.

Spot welding (single, double and multispot), projection, seam, butt and induction welding. 13 ref. (K3, K6n; ST, 4-3)

310-K. (German.) **Present Status of Welding With Heavy Duty Electrodes.** Herbert Neumann. *Oerlikon Schweissmitteilungen,* v. 15, no. 27, 1957, p. 8-22.

Development from contact to heavy-duty electrodes; means of achieving better welding results; necessity for sufficiently large sources of welding current for welding with iron electrodes. 4 ref. (K1, W29h, 1-2)

311-K. (German.) **Metallurgical Problems in Connection With the Development of New Welding Electrodes.** K. L. Zeyen. *Schweissen und Schneiden,* v. 9, May 1957, p. 186-193.

Range of application and economy of electric welding processes; new developments and present position of welding electrode metallurgy; basic electrodes; titanium-dioxide electrodes and electrodes with acid coatings; high performance electrodes; deep penetration electrodes. 37 ref. (K1, W29h, 1-2)

312-K. (German.) **Maintenance and Repair of Parts and Components by Means of Welding. Pt. II.** Herbert Neumann. *Schweissen und Schneiden,* v. 9, May 1957, p. 194-200.

Welding of joints for locomotive and ship boilers; welding, surfacing, flash-butt welding of drive and brake components, wheels, couplings, pipes; applications of various types of electrodes; welding of copper, Kuprodur, bronze; repair of castings; automatic welding processes. 4 ref. (K1, 18-21, 18-22; ST, Cu)

313-K. Solders, Fluxes. Pt. 1. Types and Characteristics. Frank J. Versagi. *Air Conditioning and Refrigeration News,* v. 80, June 3, 1957, p. 20-21.

Basic principles underlying soldering, brazing and welding; typical solders and brazing alloys. (To be continued.) (K7, K8, K1, K2; SGA-f, RM-q)

314-K. Rocket-Motor Tubes. *Aircraft Production,* v. 19, June 1957, p. 222-230.

Application of argon-arc welding to high-strength steel sheets during the manufacture of rocket-motor boost units. The conclusion reached from this successful application of welding to high-performance structures is that welding and high-strength steels are not necessarily incompatible. (K1d; ST, SGB-a)

315-K. Autoclave Bonding. N. Evans. *Aircraft Production,* v. 19, June 1957, p. 240-249.

Methods of heating, tool design and some of the advantages, as well as the drawbacks of the autoclave curing technique; comparison with the usual press method. (K12)

316-K. Assembling Housings in Automatic Welder. *Automation,* v. 4, June 1957, p. 71-73.

Twelve-station dial indexing machine welds ten separate parts to shells which then are used as the upper halves of refrigerator compressor housings. Welding cycles are automatically timed and all machine functions interlocked by means of limit switches and relays. (K1, 18-24)

317-K. Manufacture of Mineral Insulated Cables. *Engineer,* v. 203, May 24, 1957, p. 806-807.

Method consists in packing an insulating mineral powder such as magnesia to hold rod conductors inside a copper tube so that the whole assembly can be elongated by repeated drawing to produce a copper sheathed cable. (K13a; Cu)

318-K. Making "M.I." Cables. *Engineering,* v. 183, May 24, 1957, p. 649-650.

Fabrication of mineral-insulated (M.I.) cables. The powder used in magnesium oxide (magnesia) which has a very high insulating capacity, and is also a good conductor of heat. In the process, the initial tube of copper, 10 yd. long and 2 in. internal diameter, carriers within it up to seven copper conductors round

which the magnesia is rammed. (K13a; Cu)

319-K. Investigation of Gouges, Arc Burns in Steel Line Pipe. C. T. Schweitzer. *Gas,* v. 33, June 1957, p. 107-112.

A series of tests to evaluate the seriousness of gouges and arc burns in welding and to formulate methods of repairing them. Types of tests used; analysis of results. (K1, 9-21)

320-K. Titanium: Tomorrow's Metal Welded Today. *Industry and Welding,* v. 30, July 1957, p. 59-61. (CMA)

A "top hat insert" by du Pont for a nitric acid condenser demonstrates the corrosion resistance of titanium. The insert has lasted six months with intermittent use and eight months in continual use in 60% nitric acid and shows no visible signs of corrosion. The welding of the insert was accomplished by an inert-gas shielded tungsten-arc process; care was taken to insure complete penetration. (K1d, R6g; Ti)

321-K. Welding Stainless Steels. Richard E. Paret. *Machinery,* v. 63, June 1957, p. 186-192.

Characteristics of austenitic, ferritic and martensitic steels; types of welding including oxy-acetylene, metal-arc, inert-gas, atomic hydrogen, submerged-arc, stud and resistance welding. (K1, K2, K3; SS)

322-K. Adhesive Bonding of Light Metals. A. E. Williams. *Metal Industry,* v. 90, May 31, 1957, p. 457-460.

Techniques, joint design, joint efficiency, sandwich construction and testing methods used in joining aluminum, magnesium or stainless steel. (K12; Al, Mg, SS)

323-K. Heating Methods for Modern Brazing Operations. *Metal Progress,* v. 72, July 1957, p. 65.

Collection of three papers given at the 10th Western Metal Congress and Exposition. Some observations about the brazing method (fits, assembly cleanliness and alloys) are followed by specific information about three methods of heating for mass production: in furnaces with protective atmospheres of vacuum, in molten salt baths, and rapid heating in air by high-frequency electric currents. Papers abstracted separately. (K8j, K8k, K8n, 1-2)

324-K. Furnace Brazing. H. M. Webber. *Metal Progress,* v. 72, July 1957, p. 68-71.

Advantages of furnace brazing include versatility, economy of materials and time. Equipment and techniques. (K8j, 1-2)

325-K. Salt Bath Brazing. L. B. Rosseau. *Metal Progress,* v. 72, July 1957, p. 72-74.

Characteristics of dip brazing. Advantages in brazing of aluminum electronic components and aircraft honeycomb structure. (K8n)

326-K. Induction Brazing. W. E. Benninghoff. *Metal Progress,* v. 72, July 1957, p. 74-76.

Induction brazing is characterized by rapid, localized heating and offers excellent reproducibility of results. Typical applications. (K8k)

327-K. Prevention of Martensite Formation During Arc Welding. Fritz Dechner and Hermann Speich. *Metal Progress,* v. 72, July 1957, p. 194. (Digest from *Stahl und Eisen,* v. 76, Sept. 20, 1956, p. 1249-1251.)

Previously abstracted from original. See item 527-K, 1956. (K1, N8, ST)

328-K. How to Make Honeycomb Sandwich. Pt. 4. Brazed Assembly Is the Latest Method. *Metalworking Production,* v. 101, June 7, 1957, p. 979-981.

Characteristics of honycomb structure; problems of welded and brazed assemblies; brazing methods. Furnace brazing is most practical technique to date, but induction brazing shows promise. (K8j, K8k, 7-9)

329-K. 800 Welded Wheels Per Hour. *Modern Industrial Press,* v. 19, Apr. 1957, p. 21-23.

Fully automatic machine assembles and spot welds automobile wheels, pierces valve stem hole and embosses lug for hub cap. (K3n, T21c, 17-7)

330-K. How To Weld Molybdenum. R. R. Freeman and J. Z. Briggs. *Steel,* v. 141, July 8, 1957, p. 101-102. (CMA)

Brittleness has been overcome as an obstacle to molybdenum welding by using arc-cast metal and protective atmospheres. If the weld will be subject to moderate forming, it may be wise to recrystallize and hot form. Electrolytic polishing of faying surfaces is recommended. Corner or edge welds are easier than butt welds. Spot and seam resistance welding have drawbacks. Percussion, flash and pressure welding in dry hydrogen produce good re-

sults. Top weld efficiency does not exceed 50% of the strength of the base. An insert gives recommendations for brazing molybdenum. (K general; Mo)

331-K. Welding of Titanium to Hafnium. J. M. Gerken and S. A. Toftegaard. *U. S. Atomic Energy Commission,* KAPL-M-JMG-6. Dec. 18, 1956. 7 p. (CMA)

Welds of good quality between titanium and hafnium may be produced by the tungsten-arc inert-gas process. These metals form a continuous series of solid solutions of a body-centered cubic structure. Best results are obtained with a single pass on each side and adjusting to get about 2/3 penetration into the titanium on each pass. The fusion zone was harder and stronger than the two individual metals. Weld contours and other data are presented. (K1d; Ti, Hf)

332-K. Ductility of Tungsten-Arc Welds in Molybdenum. N. E. Weare, R. E. Monroe and D. C. Martin. *Welding Journal,* v. 36, June 1957, p. 291s-300s. (CMA)

Tungsten-arc welds of molybdenum were made in the dry box to study effects of atmosphere purity, initial microstructure and cleaning methods. Only atmospheric purity was important. For welds in air the best welds resulted from the use of a standard shielding cup and a leading-trailing shield unit. About 3% tungsten in a molybdenum weld lowered ductility. Consistency runs of arc-cast molybdenum were made in and out of the dry box; bend ductility differed significantly. (K9r, Q5g; Mo)

333-K. Effect of Nitrogen on the Soundness and Ductility of Welds in Molybdenum. W. N. Platte. *Welding Journal,* v. 36, June 1957, p. 301s-306s. (CMA)

Molybdenum weld metal absorbs nitrogen rapidly from argon atmospheres containing over 1%, to the detriment of the low-temperature ductility. Nitrogen is not implicated in weld porosity or hot cracking. The temperature for completely brittle fracture is raised by adding nitrogen up to 0.07%. Lesser concentrations allow the stress for brittle fracture to increase as the temperature of failure decreases, because the boundary film of nitrides tends to become discontinuous. Nitrogen in the argon should be reduced to the level of that in the metal for maximum weld ductility. (K1d, Q23p; Mo, 1-7)

334-K. Effects of Interstitial Elements on Weldability of Ti-7% Al-3% Mo and Ti-6% Al-4% V. J. F. Rudy, J. B. McAndrew and H. Schwartzbart. *Welding Journal,* v. 36, July 1957, p. 313s-320s. (CMA)

The effect of adding interstitials on the weldability of Ti-7Al-3Mo and Ti-6Al-4V was studied in the as-welded and post-welded heat treated conditions for 1/16-in. sheet. The evaluation of tension tests and free-bend transverse-weld tests shows that Ti-6Al-4V is much more weldable than Ti-7Al-3Mo. Heats of the latter containing 0.1% total interstitials were only marginally weldable. Ti-6Al-4V tolerates up to 0.21% O, but more than 0.1% N embrittles and as little as 0.07% C may add to nitrogen embrittlement. Postweld heat treatments did not give much improvement in ductility. (K9s, 2-10; Ti)

335-K. Arc Welding of Vacuum and Inert-Atmosphere-Melted Zircaloy-2. H. C. Ludwig. *Welding Journal,* v. 36, July 1957, p. 335s-351s. (CMA)

Zirconium sponge-base alloys show different weld penetrations, according to whether they were vacuum-melted or inert gas-melted. The anode heat output is higher for the latter, and is believed to depend on the diffusion and evaporation of an impurity (e.g. chlorine) which forms negative ions and increases the anode voltage. Control of the chlorine content in arc melting is suggested. (K1, C5h, 1-23; Zr)

336-K. (French.) **Welding in the Construction of the New Road Bridge Across the Save, Belgrade.** M. Radojkovic and P. Widman. *Soudage et Techniques Connexes,* v. 11, May-June 1957, p. 133-145.

Description of the new bridge and of the method used for its construction; plate girders with a 261-m. span, orthotropus slabs; welding of all slab joints in the shop as well as on the site; submerged-arc welding and welding with electrodes laid on the joint; inspection of the material on the basis of Schnadt's conceptions, a summary of which is given. I.I.W. tests and Kommerell tests. X-ray and iridium-192 testing of welds. (K1, K9r, T26p; ST)

337-K. (French.) **A Visit to the Braud Works.** *Soudage et Techniques Connexes,* v. 11, May-June 1957, p. 156-158.

Details of the fabrication of harvester-thresher machines. Equipment and welding processes used at the Braud plant, Saint-Mars-la-Jaille, near Nautes. (K general, 1-2; T3r)

338-K. (French.) **Analysis of the Papers Presented at the Public Session of the Annual Meeting of the International Institute of Welding, Madrid, 1956.** H. Gerbeaux. *Soudage et Techniques Connexes,* v. 11, May-June 1957, p. 159-187.

Summary and comments on 25 papers presented on the theme "Productivity by Welding." The main section deals with specific questions and special welding, cutting and brazing processes, welder qualification, work planning, welding in different industries of various countries, and finally productivity by welding. 28 ref. (K general, A12h)

339-K. (German.) **Application of Welding Processes to Cast Iron.** C. Hase. *Giesserei,* v. 44, June 1957, p. 370-373.

Working methods and range of application of the oxy-acetylene and electric arc welding processes; calculation of the economic efficiency of cold and hot welding; thermal cutting processes; application of the welded joint as a design element. (K1, K2, G22; CI)

340-K. (German.) **Welding of Cast Iron.** Hermann Beyer. *Giesserei,* v. 44, June 1957, p. 374-382.

Characteristics of the material; weldable and nonweldable cast iron; stress conditions; welding rods; welding methods for cast iron; hot welding; semihot welding, cold welding; structure and strength of the cast iron materials; hot vs. cold welding; economic efficiency of cast iron welding. 4 ref. (K general; CI)

341-K. (German.) **Application of Modern Welding Processes to Steel and Malleable Iron Castings.** Hans Zeuner and Kurt Zimmerman. *Giesserei,* v. 44, June 1957, p. 382-388.

Welding methods; welding electrodes; effect of alloying elements on the weldability; welded cast iron structures. 4 ref. (K general, K9s, 2-10; ST, CI-s)

342-K. (German.) **Development of a New Testing Method to Determine Hot Cracking Tendency of Primary Beads of Ordinary and Austenitic Electrodes.** Henri M. Schnadt. *Oerlikon Schweissmitteilungen,* v. 15, no. 27, 1957, p. 31-42.

A new method with the following advantages: easy and speedy performance, testing severity ranging within large limits, consistency of measuring results, clear and numerical definition of results, small consumption of base metal. Method suits any electrode gage and any metal thickness. It can be applied for research and manufacture control. (K9r, 9-22)

343-K. (German.) **Emulsion Prevents the Burning-In of Spattering in Welding Operations.** *Werkstatt und Betrieb,* v. 90, June 1957, p. 349-350.

Silicone emulsion serves to protect the surfaces of parts to be welded against the burning-in of weld spatterings. Loose spatterings can be easily wiped from the surface. (K9p, L26p)

344-K. (German.) **Special Designs of Seam Welding Machines.** Otto Gengenbach. *Werkstatt und Betrieb,* v. 90, June 1957, p. 351-355.

Seam welders are standard machines with special attachments and conveyer systems for special tasks; special apparatus with movable welding rollers but stationary stock; apparatus with fixed welding rollers under or between which the material is placed. (K3p, 1-2)

345-K. (German.) **Welding of High-Temperature Alloys.** Rolf Krause. *Werkstatt und Betrieb,* v. 90, June 1957, p. 357-360.

Reference values for autogenous, resistance and arc welding, with and without inert gas. Data for treatment of high-temperature nickel and cobalt alloys. (K1, K2, K3; Ni, Co, SGA-h)

346-K. **Solders, Fluxes. Pt. 2. How to Use.** Frank J. Versagi. *Air Conditioning and Refrigeration News,* v. 81, June 10, 1957, p. 40-41.

Factors to consider in selecting a solder. (K7; SGA-f)

347-K. **Metallurgy of Welding Aluminum and Its Alloys.** W. I. Pumphrey and E. G. West. *British Welding Journal,* v. 4, July 1957, p. 297-306.

Effect of temperature, oxygen, hydrogen and other elements in the parent metal and the weld; postwelding treatment. 10 ref. (K9n, K9q; Al)

348-K. **Metallurgical Background to Magnesium Alloy Welding.** E. F. Emley. *British Welding Journal,* v. 4, July 1957, p. 307-321.

Properties relevant to welding behavior. Brief review of welding

methods suitable for magnesium; flux entrapment problem encountered in gas welding; difficulties in gas welding alloys containing zirconium. 42 ref. (K2; Mg, *Zr*)

349-K. Consideration of the Factors Affecting Porosity in Self-Adjusting Metal-Arc Welds on Mild Steel. A. R. Muir. *British Welding Journal,* v. 4, July 1957, p. 323-335.

Discussion of two factors causing excessive porosity: quantity of deoxidant present in the weld and efficiency of the gas shield. 8 ref. (K1d; CN, 9-18)

350-K. High-Speed Production of Welded Aluminum Tubing. I. E. Suchoversky and A. S. Coghill. *Canadian Metalworking,* v. 20, June 1957, p. 28-33.

Aluminum irrigation tubing and industrial piping; high-frequency resistance welding permits versatile range of tubing. (K3, T3q, T26r; Al)

351-K. Adhesives Aim at Metalworking. *Iron Age,* v. 180, July 11, 1957, p. 63.

A number of major firms are exploring and developing adhesives for metal bonding. (K12)

352-K. A Theory of Adhesive Scarf Joints. J. L. Lubkin. *Journal of Applied Mechanics,* v. 24, June 1957, p. 255-260.

Analyzes adhesive stress distribution in bonded metal and establishes conditions under which narrow or wide adhesive scarf joints can have uniformly distributed adhesive stresses. 12 ref. (K12)

353-K. Operations on Body Components for Ford Consul, Zephyr and Zodiac Cars. *Machinery,* v. 90, June 7, 1957, p. 1274-1281.

Methods and machines used in assembly and spot welding of front fenders. (K3n, T21a; ST)

354-K. Operations on Body Components for Ford Consul, Zephyr and Zodiac Cars. *Machinery,* v. 90, June 14, 1957, p. 1316-1327.

Operations and equipment used in multiple-spot welding of steel floors and chassis to form automobile underbodies. (K3n, T21a; ST)

355-K. 400 Volkswagen Transports a Day. David Scott. *Metalworking Production,* v. 101, May 31, 1957, p. 923-932.

Arc and spot welding jigging and handling procedures in assembly of Microbus and truck frames and bodies. (K1, K3n, T21a, 1-2)

356-K. How to Make Honeycomb Sandwich. Pt. 3. Sandwich Assembled With Adhesives. E. J. Tangerman. *Metalworking Production,* v. 101, May 31, 1957, p. 937-941.

Lists commonly used adhesives and illustrates cleaning and curing methods used in adhesive bonding of honeycomb assemblies. (K12, 7-9)

357-K. Multi-Head Welding Equipment for Motor Bodies. J. A. Wright. *Metropolitan-Vickers Gazette,* v. 28, Apr. 1957, p. 97-101.

The portable spot welder compared with the multi-head machine. Multi-head machine currently in use in the production of subassemblies for Ford car bodies at Briggs Motor Bodies, Dagenham, England. (K3n, 1-2)

358-K. Brazing, Adhesive Bonding, Resistance Welding. Three Joining Methods for High-Temperature. *SAE Journal,* v. 65, May 1957, p. 62-64.

Methods commonly used for attaching the airplane skin to the honeycomb core.
(K8, K12, K3; SGA-h, 7-9)

359-K. How to Avoid Trouble With Stainless Welds. Pt. 1. George E. Linnert. *Steel,* v. 140, June 24, 1957, p. 116-119.

Cracks and failures usually due to notch effects, stress corrosion factors and surface contamination with materials such as carbon, sulphur or zinc. (K general, R1d, 9-22; SS)

360-K. How to Avoid Trouble With Stainless Welds. Pt. 2. George E. Linnert. *Steel,* v. 141, July 1, 1957, p. 70-72.

Effects of contamination by zinc and sulphur. (K general; SS)

361-K. How to Braze Titanium. *Steel,* v. 141, July 22, 1957, p. 103-106. (CMA)

Most common brazing procedures are satisfactory on a laboratory scale, provided the surface is prepared properly and the atmosphere is controlled. Water vapor must be removed from the helium or argon used. Silver or silver-base alloys are the preferred brazing alloys; copper, aluminum, and sometimes nickel, give good results also. Titanium-base brazes cause undercutting of the metal. Resistance, torch and induction brazing are discussed. (K8; Ti)

362-K. Bonding Ceramic Tool Tips to Steel Shanks. H. J. Siekmann.

Tool Engineer, v. 39, July 1957, p. 101-104.

Cutting tests with adhesive bonded ceramic tips indicate strength of epoxy cemented joints; bonding methods used. (K11b; SGA-j)

363-K. Study of Effects of Alloying Elements on the Weldability of Titanium Sheet. J. F. Rudy, J. B. McAndrews and H. Schwartzbart. Wright Air Development Center, Technical Report 53-230, Pt. 3. *U. S. Office of Technical Services,* PB 131049, Mar. 1957, 151 p. (CMA)

Ti-6Al-4V was studied to determine the weldability effects of interstitial contamination, to complete a study encompassing the alloys Ti-5Al, Ti-7Al-3Mo and Ti-25V. Fifteen titanium alloys were tested mechanically as fabricated, as welded and post-weld heat treated to determine weldability. The major loading stresses in tensile and free bend tests were transverse to the welding direction. (K9s, 2-10; Ti, 4-3)

364-K. Attaching Thermocouples by Capacitance Welding. Naval Gun Factory. *U. S. Office of Technical Services,* PB 121901, Apr. 1955, 8 p. 50c.

Through a capacitance welding technique thermocouple wires are welded individually to the workpiece through discharge of a bank of charged capacitors. Weld characteristics are controlled by means of a potentiometer. The welder is portable and operates from standard power supply. (K1, 1-2, X9q)

365-K. Development of Argon-Arc Welding in the Aircraft Industry. F. W. Copleston. *Welding and Metal Fabrication,* v. 25, May 1957, p. 178-182.

Application of tungsten, argon-shielded arc welding in aircraft industry listing material and components welded, types of hand welded torches and automatic welding equipment. (K1d, 1-2)

366-K. Welding Nuclear Power Station Units. *Welding and Metal Fabrication,* v. 25, June 1957, p. 196-203.

Problems involved, welding techniques and testing. (To be concluded.) (K general, W11p)

367-K. Spot Welding Applications in the Continental Railway Industry. C. A. Burton. *Welding and Metal Fabrication,* v. 25, June 1957, p. 204-211.

Examples of resistance welding applications being carried out by European rolling stock manufacturers. (K3n, T23)

368-K. High Vacuum Furnace Brazing. *Welding and Metal Fabrication,* v. 25, June 1957, p. 212-214.

New method of brazing stainless steel and high-nickel alloys which involves the use of a high-vacuum resistance-heated furnace eliminates need for a flux. (K8j, 1-23; SS, Ni)

369-K. Design for Welding. T. B. Jefferson. *Welding Engineer,* v. 42, Mid-June 1957, p. 7-20.

Proper weld design for satisfactory service and ease in manufacture. Data sheets on grooves for arc and gas-welded joints, weld metal requirements, types of welded joints, computing weld stresses, welding symbols, estimating weight of electrode metal and cost estimation. (K general, 17-1)

370-K. Welding Articles of 1956-1957. *Welding Engineer,* Mid-June 1957 p. 24-27.

Brief abstracts of 96 articles appearing in *Welding Engineer* from June 1956 to July 1957; topics include arc welding, brazing, soldering, construction, design, gas welding, inspection, resistance welding and statistics. (K general, 11-15)

371-K. Engineering Reference Data Sheets. *Welding Engineer,* v. 42, Mid-June 1957, p. 28-36.

Trade name of commonly used iron and iron powder electrodes, trade name and composition of silver brazing alloys, data on selecting proper gas welding process, welding and cutting tip numbers and sizes, difficulties in metal arc welding, melting points and color scale for common metals and alloys and the properties of acetylene, propane and oxygen. (K general, S22)

372-K. Time-Temperature Effect on Properties of Weld Heat Affected Zone in Type-347 Stainless Steel. E. F. Nippes, B. Schaaf, W. L. Fleischmann and R. L. Mehan. *Welding Journal,* v. 36, June 1957, p. 265s-270s.

Samples were heated in synthetic welding cycles to a peak temperature of 2450° F. to establish time-temperature behavior of high-temperature metallurgical structure established in welding cycle. Mechanical properties were not impaired by high-temperature heat treatment. Corrosion resistance in nitric acid is time-temperature dependent. 7 ref. (K9n, 2-11, 3-17; SS)

373-K. Relative Behavior of Notch-Toughness Tests for Welded Steel. W. J. Murphy, W. D. McMullen and

R. D. Stout. *Welding Journal,* v. 36, June 1957, p. 307s-311s.

Clarification and correlation of notched slow-bend (Kinzel), Naval Research Laboratory (NRL) drop-weight and V-notch Charpy tests. 6 ref. (K9r, Q23s; ST)

374-K. Welding of Magnesium Alloys. Paul Klain. *Welding Journal,* v. 36, July 1957, p. 321s-329s.

Weldability, metallurgy and properties of magnesium alloys currently produced in the United States; various welding methods. 5 ref. (K general; Mg)

375-K. Practical Welding Metallurgy of Nickel and High-Nickel Alloys. George R. Pease. *Welding Journal,* v. 36, July 1957, p. 330s-334s.

Effect of 20 elements on weldability which may be present in nickel alloys. Cracking seldom if ever can be traced to presence of dissolved gases. 8 ref. (K9s, 2-10; Ni)

376-K. Self-Fluxing Airproof Brazing Alloys. Nikolajs Bredzs and Harry Schwartzbart. *Welding Journal,* v. 36, July 1957, p. 348s-352s.

Theoretical considerations governing formulation of above alloys. Combination of lithium-boron would appear almost ideal. A Cu-Ni-Li-B alloy used to braze steels in air, although not commercially feasible, demonstrates principles outlined. 4 ref. (K8; SGA-f)

377-K. Recent Developments in Magnetic-Force Welding. E. J. Funk. *Welding Journal,* v. 36, June 1957, p. 576-582.

Characteristics of machines of present design, methods of controlling electrode-force application, new type of welding process. (K3, 1-2)

378-K. Design, Fabrication and Erection Practices for Efficient Welded Highway Bridges. Omer Blodgett. *Welding Journal,* v. 36, June 1957, p. 583-592.

Summary of practices over past ten years by which various states have achieved savings in material and time by substituting welded bridges for riveted constructions. (K general, T26p, 17-1; ST)

379-K. Gas-Shielded Metal-Arc Welding of High-Pressure Valves. Fred R. Zacheus. *Welding Journal,* v. 36, June 1957, p. 593-596.

Inert-gas welding process shows improvement in uniformity and quality of welds, reduction in unit cost and better operator safety. (K1d, T7b)

380-K. Evolution of High-Tensile Weld Metal With Low-Hydrogen Electrodes. D. C. Smith. *Welding Journal,* v. 36, July 1957, p. 677-692.

Some of the causes underlying the unsatisfactory performance of conventional-type coatings and evolution of higher strength weld metals which have kept pace with the steels. 7 ref. (K1a; ST)

381-K. High-Frequency Resistance Welding. Wallace C. Rudd. *Welding Journal,* v. 36, July 1957, p. 703-707.

High-frequency resistance heating for strip and tube welding. (K3; 4-3, 4-10)

382-K. Multipass Welding of Steel Pipe With CO_2. E. A. Quinlan, Don Alrick and A. P. Demmer. *Welding Journal,* v. 36, July 1957, p. 710.

Of four welding processes, gas-shielded metal-arc process with automatic welding head, using CO_2, was best for 40-ft. pipes welded in 200-ft. sections. (K1d; ST, 4-10)

383-K. Vacuum Brazing Economical Method for Large, Continuously Bonded Multi-Metal Assemblies. R. C. Bertossa. *Western Metals,* v. 15, July 1957, p. 58-60.

Advantages, applications, potential uses. (K8, 1-23)

384-K. Properties of Welds Made Under Argon and Carbon Dioxide. E. M. Eskin, E. P. Pogozhkin and N. M. Novoshilov. *Svarochnoe Proizvodstvo,* no. 1, Jan. 1957, p. 15-17. (*Henry Brutcher Translation* no. 3947).

Comparative study of properties of welds made with consumable electrodes with alternating current, using a high-frequency generator, in an atmosphere of argon as against one of carbon dioxide. Steel compositions used; particulars on welding variables; mechanical properties (tensile, bend, impact, creep and fatigue tests) of welds obtained in argon versus carbon dioxide. Various qualitative characteristics (arc stability, weld shape, penetration, etc.) of welds in high and low-alloy steels. (K9n, K1d, AY, SS)

385-K. (German and French.) **Temperatures During Brazing.** G. M. Blanc. *Zeitschrift für Schweisstechnik,* v. 47, June 1957, p. 148-150.

Definition of French, English and German terminology currently employed in brazing; working tempera-

tures and wetting temperatures and related terms. (K8)

386-K. (German and French.) **Welding of Cast Iron.** Curt C. Elster. *Zeitschrift für Schweisstechnik,* v. 47, June 1957, p. 150-154.

The welding process and its application to repairs in industry. (Concluded.) (K general, 18-22; CI)

387-K. (German.) **Bonding of Light Metals.** J. Bernert. *Fertigungstechnik,* v. 7, Jan. 1957, p. 43-45.

Effect of hardness of thermosetting adhesives on strength and corrosion characteristics. 8 ref. (K12; EG-a39)

388-K. (German.) **Application of Welding in the Repair of Machinery.** K. Weber. *Schweissen und Schneiden,* v. 9, June 1957, p. 280-283.

For the welding of cast iron a suitable preheating procedure eliminates distortion and cracking. Cast iron filler rods for depositing high-manganese weld metal have been developed with coatings which produce protective slag deposits. Low-temperature welding is also used, and if the weld is properly designed and suitably reinforced satisfactory working conditions can be obtained. With suitable pre and post-heating procedures, high-tensile steel castings can also be safely repaired by welding.
(K9p, K9q, 18-22; CI, ST)

389-K. (German.) **Special Welding Methods in the Manufacture of Alloy Sheet Steel Structures.** W. Liebig. *Schweissen und Schneiden,* v. 9, June 1957, p. 297-298.

The hollow steel blades used in impellers for wind tunnels differ from aeroplane wings in that the blades show a twist. The important consideration in welded design is the stiffness of the blades.
(K general, T26, 17-1; ST, 7-1)

390-K. (German.) **Importance of Welding in the Working of Copper and Copper Alloys.** Reiner Köcher. *Schweissen und Schneiden,* v. 9, June 1957, p. 299-301.

The autogenous fusion process is at present mostly used. The argon-arc process is used for welding thin sheets and has also shown promise in welding copper-plated boiler plate. The inert-gas-shielded welding of copper (sigma process) produces welded seams of high purity and good mechanical properties. Procedures for welding brass, tin bronze, silicon bronze, aluminum bronze and copper-nickel alloys. (K1; Cu)

391-K. (German.) **Multi-Spot Welding in Large Welding Machines as a Means of Mass Production.** Anton Weis. *Schweissen und Schneiden,* v. 9, June 1957, p. 304-307.

A semi-automatic multi-spot welding device reduced operating times by 87%. It is doubtful whether the use of press-type welding machines together with the application of interchangeable multi-spot welding tools is always advantageous. They make it possible, however, to build up a type of transfer line in which similar components can be completely welded, and which can be easily switched from the manufacture of one component to another.
(K3n, 1-2)

392-K. (German.) **The Use of Gas Welding in the Manufacture of Railroad Track Crossovers.** K. Hilgers and A. Heim. *Schweissen und Schneiden,* v. 9, June 1957, p. 318-321.

Crossovers are most critical parts of a railway track. The oxy-acetylene welded crossover is usually far superior to the bolted one, both technically and economically. Metallurgically, good results are obtained by employing the oxy-acetylene welding process. (K2h, T23q; ST)

393-K. (German.) **Developments of "Thermit" Welding.** W. Ahlert. *Schweissen und Schneiden,* v. 9, June 1957, p. 321-324.

Welding of rails by "thermit welding" is possible in much shorter times than was possible with older processes. The reduction in preheating time and the application of prefabricated molds make economic operations of 10 to 12 min. duration possible. The alumino-thermic building up of rails is used for the repair of damaged rail surfaces. Rails repaired by this process can be used as if they were completely new. (K4, T23q)

394-K. (Italian.) **Equilibrium in the Slag-Metal Reaction in Arc Welding. Pt. 3. Equilibrium of the Silicon Reaction.** Agostino Bargone, Vittorio Gottardi and Piero Jadanza. *Rivista Italiana della Saldatura,* v. 9, Jan-Feb. 1957, p. 9-16.

Slag-metal system tends to attain thermo-dynamic equilibrium, but all conditions necessary for this are not usually present. However, if such conditions are artificially created, it is possible, in certain cases, to obtain concentrations corresponding to

those thermodynamically calculated for equilibrium conditions. 11 ref. (K9n, K1; RM-q)

395-K. (Russian.) **Study of Titanium Welding.** M.Kh. Shorshorov, G. V. Nazarov, T. A. Amfitestrova and A. A. Baykov. *Svarochnoye Proizvodstvo,* no. 4, Apr. 1957, p. 1-5.

Study of the weldability of technically clean titanium of different grades carried out in the laboratory. The greatest difficulties are connected with the deterioration of the properties of the basic metal in the zone near the joint. It is necessary to select a technology and system of welding based on conditions whereby the time will be reduced, during which the metal is at the temperature where the intensive beta-phase grain growth takes place so that the rate of cooling during the transition from the beta to alpha phase will be reduced. (K9s; Ti)

396-K. (Spanish.) **18-4-1 Co High Speed Steels. Metallurgical Problems in Flash Welding to a Carbon Steel.** F. A. Calvo. *Ciencia y Técnica de la Soldadura,* v. 7, Mar-Apr. 1957, 12 p.

High-speed steel overlays on carbon steel tool bases. Any defects in high-speed steel accentuate problems of flash welding; deep decarburization and formation of eutectic in high-speed steel result from prolonged low-strength arc discharge; partial or total breakdown of eutectic areas causes formation of graphite; presence of grains of high-speed steel dissolved in carbon steel promotes formation of eutectic in lamellar form, and hence of brittleness. Most of above phenomena can be avoided, or their harmful effects reduced, by controlling current strength, duration of arc discharge, joining pressure, cooling speed. 3 ref. (K3r, L24; CN, TS-n)

397-K. Welded Wire Mesh and Wire Screening. A. Jasper. *Draht (English Edition),* no. 28, Apr. 1957, p. 15-21.

Material used, machines for straightening and feeding wire, resistance welding procedure and details of electrical and control equipment for welding wire mesh, welded steel mesh used for reinforcing concrete and glass. 5 ref.
(K3, K13s; ST, 4-11)

398-K. You Can Weld Paper-Thin Stainless. J. C. Collins and S. P. Jenkins. *Industry and Welding,* v. 30, Aug. 1957, p. 42-44, 74, 76.

Problems and solutions of butt welding along 72-in. length of stainless steel 0.005 in. thick for exterior skins of supersonic aircraft. (K1; SS, 4-6)

399-K. How To Braze Titanium. Harry Schwartzbart. *Iron Age,* v. 180, Aug. 1, 1957, p. 100-103. (CMA)

Titanium and its alloys can be successfully brazed by a number of processes, including torch, furnace, induction and resistance heating. Silver and its alloys are favored filler metals, since their intermetallic compounds with titanium are relatively ductile. Current studies are concerned with the addition of lithium to silver-base alloys to increase their wettability and lower the melting point. (K8; Ti)

400-K. Automatic Spot Welding of Aluminum. *Light Metal Age,* v. 15, June 1957, p. 10-12.

Large spot welding units with tape-controlled positioning tables spot weld large contoured aircraft panels. (K3n, 1-2; Al)

401-K. Basic Factors in Brazing Alloy Selection and Joint Design. Lester F. Spencer. *Tooling and Production,* v. 23, Aug. 1957, p. 93-97.

Brazing methods, properties and recommended applications of brazing metals and alloys. 4 ref.
(K8, 17-1; SGA-f)

402-K. Metallurgy of Welding of Certain Austenitic Heat and Corrosion Resistant Alloys. Anthony H. Waterfield and Russ P. Culbertson. *Welding and Metal Fabrication,* v. 25, July 1957, p. 244-250.

Nickel-base, cobalt-base and iron-base alloys and methods for welding them are considered. Most welding methods available for stainless steels can be used provided proper precautions are observed.
(K general; SS-e, Ni, Co, Fe)

403-K. Tig—for the Metals That "Couldn't be Welded". Jack Fairlie. *Welding Engineer,* v. 42, June 1957, p. 32-37.

History of process, current selection, four steps in torch manipulation and future for Tig. (K1d)

404-K. Tig and Magnesium Allies in Design for Strength. Jack Fairlie. *Welding Engineer,* v. 42, June 1957, p. 44-45.

Tig process at Magcoa more economical than Mig. (K1d; Mg)

405-K. British Weld Studs for Plane Test Sites. William A. Heath. *Welding Engineer,* v. 42, July 1957, p. 39.

Stud welding of new closed-circuit supersonic wind tunnel at the Royal Aircraft Establishment. (K1f)

406-K. Vacuum Brazing Economical Method for Large, Continuously Bonded Multi-Metal Assemblies. R. C. Bertossa. *Western Metals,* v. 15, July 1957, p. 58-60.

Vacuum brazing of large surface areas, cladding carbon steels, stainless and nonferrous metals with corrosion or oxidation resistant materials such as high-temperature alloys, stainless, titanium, etc.
(K8, 1-23, L22; SGA-g, SGA-h)

407-K. Some Problems of the Metallurgy of Semi-Automatic Welding of Stainless Steel Using Unfused Siliceous Fluxes. A. I. Akulov. *Avtomaticheskaya Svarka,* v. 8, 1955, p. 50-54. (*Henry Brutcher Translation* no. 3794.)

Interaction between flux and metal in weld puddle; effect of ferrosilicon as compared to silica, upon silicon content of weld metal; introduction of ferrosilicon into the flux to minimize loss of chromium by oxidation and to insure the required contents of silicon and manganese in weld; results obtained with unfused fluxes in the welding of titanium-stabilized stainless steels.
(K9n, K1; RM-q, SS)

408-K. (Spanish.) **Welding Provides Economy and Speed in Repair of Rolling Stock of Italian Government-Owned Railways.** Carlo Bologni and Mario Voltolini. *Ciencia y Técnica de la Soldadura,* v. 7, May-June 1957, 10 p.

Methods and techniques used in construction and repair of fire boxes, application of metal banding to wheel hubs, repair of rolled steel wheels of diesel locomotives, spokes and hubs of electric and steam locomotives, locomotive cylinders, electric locomotive bogies, diesel engine cylinder heads, etc.
(K general, T23, 18-22)

409-K. (Russian.) **High-Speed Steel Welding Alloys.** M. S. Polyan. *Stanki i Instrument,* v. 28, Jan. 1957, p. 30-31.

Generally four carbide-forming elements are used in alloying: Cr, W, Mo, and V. From 5 to 10% cobalt is also added, which slows down diffusion and increases durability at high temperature; graphs of hardness versus temperature for eight alloys. 3 ref. (K9s, 2-10; TS-m)

410-K. Fundamentals of Brazing. N. Bredzs and H. Schwartzbart. Armour Research Foundation. Army Ordnance, *U. S. Office of Technical Services,* PB 121553, Dec. 1955, 101 p. $2.75.

Concerned with two fundamental problems—the mechanism of the formation of the metallic bond in a brazed joint; and correlation between the bonding mechanism and the strength of brazed joints. (K8)

411-K. Fundamental Studies on the Adhesion of Organic Materials to Metal Substrates. R. L. Patrick and W. A. Vaughan. Quantum, Inc. (Wright Air Development Center), *U. S. Office of Technical Services,* PB 121982, Dec. 1956, 121 p. $3.25.

Investigation of the controlling factors which influence the bonding of adhesives and coatings. Model systems were prepared by depositing monolayers on substrates with weight added as bulk polymer polymerized directly onto the monolayer. The samples were then ruptured. (K12)

412-K. Research on Elevated Temperature Resistant Ceramic Structural Adhesives. Pt. 2. H. G. Lefort, R. M. Spriggs and D. G. Bennett. University of Illinois. (Wright Air Development Center.) *U. S. Office of Technical Services,* PB 121941, Jan. 1957, 74 p. $2.

Adhesives were found which yielded 1200 psi. shear strength at room temperature; others 1100 psi. at 600° F; 1500 psi. at 800° F; 2300 psi. at 900° F.; and 800 psi. at 1000° F. No single adhesive, however, possessed all of those strengths. Best performance was shown by porcelain enamel ceramic adhesives with thermal expansion approaching that of ingot iron. (K12, 2-12)

413-K. Elevated Temperature Resistant Silicone Structural Adhesives for Metals. F. J. Riel, Jr., and M. B. Smith. Narmco, Inc. (Wright Air Development Center.) *U. S. Office of Technical Services,* PB 131024, Mar. 1957, 41 p. $1.25.

The first type of materials studied, polymers made from polyhydroxy compounds and halosilanes, proved too susceptible to hydrolysis. The second line of approach was the synthesis of polysiloxane and polysilane resins containing tolyl groups, followed by oxidation of the tolyl groups to polar carboxyphenyl groups. Evaluation of the carboxyphenyl polysiloxanes showed them

to be better high-temperature resistant laminating resins than metal-to-metal adhesives when compared to conventional commercially available silicones. (K12)

414-K. On the Mechanism of Hot Cracking of Welds. V. A. Toropov. *Metallovedenie i Obrabotka Metallov,* June 1957, p. 54-58. (*Henry Brutcher Transalation* no. 3982.)

Critical literature review; dependence of resistance of weld metal to hot cracking upon temperature and nature of solidification of the constituents making up the intergranular substance; limitations to this relationship; study of certain ternary alloys having a eutectic; examples; possibility of improving the resistance to weld hot cracking by changing the relative quantities of intergranular constituents or by introducing new ones. (K9n, 9-22)

415-K. Segregation in Fusion Zone and in Solidification Layers as Related to the Diffusion Between Solid and Liquid Phases in the Freezing of Welds. A. M. Makara and A. A. Rossoshinskii. *Avtomaticheskaya Svarka,* v. 9, no. 6, 1956, p. 65-76. (*Henry Brutcher Translation* no. 3991.)

Study of heterogeneity in fusion zone and solidification layers formed directly during the welding of alloy steels, to throw light on such practical problems as cracks in the weld metal and the latter's mechanical properties. Bearing of diffusion between co-existing solid and liquid phases (due to the greater solubility of such elements as C, S and P in liquid than in solid steel) on this heterogeneity which develops during the welding process proper and independently of what happens in subsequent heat treating or high-temperature service. Causes of periodicity of solidification of weld metal. (K9n, N12)

416-K. (French.) **Vast Possibilities of Welding in the Field of Parts Subject to Heavy Stresses.** Albert Maier. *Revue de la Soudure,* v. 13, no. 2, 1957, p. 78-92.

Materials and welding techniques applicable to construction of equipment for the chemical industry, steam boilers and hydraulic installations in particular. Urges expanded use of welding in construction of thickwalled bodies destined to withstand heavy pressures. 4 ref. (K general, T29, T26q)

417-K. (French.) **Contribution to the Study of Sealing Runs in Arc Welding.** J. Daivier. *Revue de la Soudure,* v. 13, no. 2, 1957, p. 102-111.

Verification by X-ray and mechanical tests of complete penetration of welds finished by means of electrodes and without prior chipping or chiseling. Whichever the type of joint, sealing runs made with electrodes providing deep penetration and by automatic welding give perfect welds. (K1, K9n)

418-K. (French.) **Classification of Steels Suitable for Welded Construction.** M. W. Bonhomme. *Revue de la Soudure,* v. 13, no. 2, 1957, p. 112-116.

Discussion of work of Commission on Effects of Welding on the Behavior of Metals of International Welding Institute in attempting to establish weldability norms, with special attention to problem of brittle fracture. (K9s, Q26s; ST)

419-K. (German.) **Efficient Production With Special-Purposes Resistance Welding Machines.** F. Lambrecht. *Schweissen und Schneiden,* v. 9, July 1957, p. 355-358.

Requirements for the application of special-purpose welding machines; special designs illustrated and described. (K3, 1-2)

420-K. (German.) **Interesting Problems in Welding Applications in a Gas Distribution Plant.** H. Jürgens. *Schweissen und Schneiden,* v. 9, July 1957, p. 358-360.

Development of welded branch pipes for cast mains; manufacture and fitting; protection against corrosion by flame cleaning and plastic coating. (K general, 4-10)

421-K. (Italian.) **History and Influence of Welding in Naval Construction.** Franco Salerno. *Rivista Italiana della Saldatura,* v. 9, Mar-Apr. 1957, p. 64-68.

Description of first arc welding applications in shipbuilding during World War II by U. S. Maritime Commission; principal causes of ship failures and how they have been overcome by improvements in design and steel specifications and by arc welding processes; advantages of welded construction, including prefabrication, structural lightness and reduced labor time. (K general, T22)

422-K. (Russian.) **Energy Consumption of Electric Welding Apparatus in Pipe Production.** V. P. Anisiforov and

F. P. Kirpichnikov. *Vestnik Mashinostroenia,* v. 37, Feb. 1957, p. 31-35.

Energy consumption is measured in the operation of two identical units, making 51 × 2.0 to 152 × 6.0-mm. pipe. Graph of energy consumption according to wall thickness of the pipe. (K1, 1-2; 4-10)

423-K. Flexible Plates for 8-Ft. Supersonic Tunnel at the R.A.E., Bedford. T. Nellis and T. S. Burns. *British Welding Journal,* v. 4, Aug. 1957, p. 345-353.

Fabrication of three large flexible steel plates and procedure for each welding operation.
(K general; ST, 4-3)

424-K. Welding of Aluminum Tanks for Experimental Reactors. J. F. Lancaster. *British Welding Journal,* v. 4, Aug. 1957, p. 354-360.

Fabrication problems and methods of overcoming them, such as welding of dissimilar and variable thicknesses of pure aluminum plate and cracking in 99.8% purity aluminum fillet welds. 5 ref.
(K general, W26q; Al)

425-K. A Century of Resistance Welding. H. J. Nichols. *Canadian Metalworking,* v. 20, July 1957, p. 38-41.

History of development of resistance welding; processes for butt seam, spot and flash welding.
(K3, A2)

426-K. Have You Considered Silver Brazing? A. M. Setapen. *Design Engineaering,* v. 3, Jan. 1957, p. 29-33, 51.

Attributes include flexibility and ability to produce strong, uniform joints in a large variety of metals. Brazing with silver alloy filler metals is a quick, convenient, clean method for joining any combination of light or medium-gage metals whose melting points are above approximately 1500° F.
(K8; SGA-f, Ag)

427-K. Dielectric Heat Cooks Metal Sandwiches. Don W. Cole. *Metalworking Production,* v. 101, Aug. 9, 1957, p. 1377-1380.

Possibilities of radio-frequency heating for adhesive bonding of metal sandwiches. (K12, W29n, 1-2)

428-K. Brazing for High Temperature Use. G. S. Hoppin, III. *Steel,* v. 141, Aug. 26, 1957, p. 82-86.

Application of brazing in assembly of variety of jet engine components; brazing with nickel-base alloys in dry hydrogen atmospheres provides method for joining stainless steel and other alloys used at high temperatures but problems of erosion, brittleness, adverse thermal effects and need for high purity of atmosphere require close process control.
(K8, 2-12; SGA-h)

429-K. Developments in the Argonarc Spot Welding Process. J. L. Steer and F. W. Copleston. *Welding and Metal Fabrication,* v. 25, Aug. 1957, p. 282-288.

Features of process as applied to stainless steel such as economy, quality and consistency.
(K1d, K3n; SS)

430-K. (French.) **Assembly of Laminated Parts.** J. Ch. Vienot. *Chimie et Industrie,* v. 77, May 1957, p. 1038-1042.

Solid assembly can be achieved in small complex parts by means of leaves stacked to give desired shape. Of various methods of joining the lamellae, most interesting appears to be by means of "fusion" of the metallic films electrolytically deposited on each of the surfaces to be joined. 5 ref. (K12)

431-K. (French.) **Welding in the Construction of Equipment for Highway Transport.** E. Demaret. *Revue Universelle des Mines,* v. 13, Aug. 1957, p. 395-404.

Study of residual tensions and brittle fracture enables formulation of design principles for arc welded frames and chassis and for execution and control of arc welds. Improvements in resistance welding machines open way to new time and money-saving applications of welding. Detailed listing of applications to vehicle construction of each type of welding. 31 ref.
(K1, K3, T21e, 17-1)

432-K. (German and French.) **Present State and Future Development of the Arc Welding of Steel.** M. E. Folkhard. (Continued.) *Zeitschrift für Schweisstechnik,* v. 47, Aug. 1957, p. 192-197.

Several welding methods are surveyed including carbon dioxide submerged arc welding, the Unionarc process and Tig welding. 3 ref.
(K1; ST)

433-K. (Spanish.) **Multiple-Spot Welding Methods for High Speed Production.** H. W. Roth. *Ciencia y Técnica de la Soldadura,* v. 7, May-June 1957, 6 p.

Description, advantages and disadvantages of three methods: hydromatic, ultra-rapid, multiple transformer. (K3n)

434-K. The Production Man's Guide to Joining Welded Steel Tubing-Carbon-Alloy-Stainless. *American Machinist,* v. 101, Sept. 9, 1957, p. 149-164.

Picture-captions showing 116 different ways of joining one piece of welded steel to another tube and to other parts. Methods are divided into two basic classifications--welding and mechanical.
(K general; ST, AY, SS, 4-10)

435-K. Three Cantor Lectures. H. G. Taylor. *British Petroleum Equipment News,* v. 6, Summer 1957, p. 61-65.

Historical review of resistance welding; aircraft and jet engine applications. (K3, A2)

436-K. Arc Welding Pointers for High Operator Efficiency. John Deleff. *Canadian Metalworking,* v. 20, Aug. 1957, p. 38-43.

Basics of manual arc welding covers machine setting, electrode angle, arc length and speed of travel; causes of common weld faults. (K1)

437-K. What You Should Know About Zirconium. T. A. Dickinson. *Industry and Welding,* v. 30, Sept. 1957, p. 54-55. (CMA)

Properties of zirconium. Zirconium is most readily welded with spot or seam resistance equipment. In inert-arc welding the gas should shield both sides of the weld area. Clean materials are important in both techniques. Use of a filler depends on design. When filler is used, oxidation is minimized by flame-spraying the zirconium surface with a ceramic coating, which acts as a flux. (K1, K3; Zr)

438-K. Procedures for Brazing by Torch, Gas-Air Burner, and Salt Bath. Lester F. Spencer. *Tooling and Production,* v. 23, Sept. 1957, p. 85-90.

General procedures in brazing copper, aluminum or steel assemblies by torch, gas-air burner, dip or salt bath methods. 7 ref.
(K8; Cu, Al, ST)

439-K. Solder Bonding Aluminum to Uranium. H. W. Mishler, J. T. Niemann, R. P. Sopher and D. C. Martin. Battelle Memorial Institute. *U. S. Atomic Energy Commission,* BMI-923, July 7, 1954, 27 p.

Study to determine if flat-plate fuel elements could be produced by solder bonding aluminum sheets to a uranium core. It was necessary to plate the uranium with chromium, iron, or nickel which served as a diffusion barrier. The solders used were lead, tin, zinc and their alloys. The best bonds were produced with aluminum plated with 0.5 mil of copper and nickel-plated uranium given a copper flash.
(K7, T11g; Al, U)

440-K. Research on Elevated Temperature Resistant Inorganic Polymer Structural Adhesives. Pt. 2. H. H. Levine. Quantum, Inc. (Wright Air Development Center), *U. S. Office of Technical Services,* PB 121908, Nov. 1956, 30 p. $.75.

Inorganic materials other than ceramics as high-temperature, metal-to-metal adhesives; an inorganic adhesive stable at 800° F. with room-temperature shear strength of 285 psi was obtained from the ammeline-phosphorus pentoxide reaction product; titanium dioxide priming of the steel increased the bond strength from an original value of 65 psi.
(K12; NM-a34, 2-12)

441-K. Development of Metal-Bonding Adhesive With Improved Heat Resistance. J. M. Black and R. F. Blomquist. Forest Products Laboratory. (Wright Air Development Center), *U. S. Office of Technical Services,* PB, 121856, April 1957, 20 p. $.50.

Tests were conducted to improve the heat aging characteristics of an experimental phenol-epoxy resin tape adhesive (FPL-878) developed earlier by the laboratory. The tape form, supported by glass mat carrier, produced better bonding of sandwich material, but lacked the resistance to long-time heat aging at high temperatures shown by the liquid form.
(K12; NM-d34)

442-K. Soldering Aluminum. J. D. Dowd. *Welding Engineer,* v. 42, Sept. 1957, p. 43-50.

Compositions and melting ranges of soldered alloys for joining aluminum to itself or other metals; information on organic fluxes, fluoride containing salt fluxes, heating methods, flux residue removal and the corrosion resistance of soldered joints. (K7; Al, RM-q)

443-K. Metallurgy of the Welding of Certain Austenitic Heat and Corrosion-Resistant Alloys. Anthony H. Waterfield and R. P. Culbertson. *Welding Journal,* v. 36, Aug. 1957, p. 360s-365s.

Metallurgical properties of six corrosion resistant and heat resistant alloys of high alloy types with nickel, iron or cobalt base are considered in light of their effect on welding techniques. Briefly discusses alloy development and use. (K9n; SS, SGA-g, SGA-h)

444-K. Problems Associated With the Welding of T-1 Material. Perry C. Arnold. *Welding Journal,* v. 36, Aug. 1957, p. 373s-381s.

Problems encountered in field welding of spherical pressure vessels of T-1 steel with working stress of 32,000 psi., transverse cracking and other difficulties eliminated by rebaking of electrodes and mild preheat. (K9p, K1; ST, SGB-a)

445-K. Studies of Welding Arcs Using Various Atmospheres and Power Supplies. T. B. Hazlett and G. M. Gordon. *Welding Journal,* v. 36, Aug. 1957, p.. 382s-386s.

Study of arc characteristics, bead shape, weld penetration, metal transfer mechanism using d-c generator or rectified a-c power supply for consumable electrode, gas-shielded welding of AISI 1020 rolled steel with mild steel welding wire. Surface beads made in atmospheres of carbon dioxide, helium, argon and argon plus 5% oxygen with straight and reversed polarities. 9 ref. (K1, W29a, 1-2)

446-K. Ni-Cr-B Brazing of a High-Temperature Alloy. George Aggen, Roger A. Long and Edward E. Reynolds. *Welding Journal,* v. 36, Aug. 1957, p. 366s-372s.

Brazing investigation conducted on sheet and bar specimens of A286, iron base precipitation hardening high temperature alloy; brazing performed with nickel-chromium-boron brazing alloy in continuous belt furnace under dry hydrogen atmosphere; joints evaluated by metallographic examination and mechanical tests. (K8; SGA-h)

447-K. Automatic Inert-Gas-Shielded Tungsten-Arc Welding of Aluminum Alloys. H. D. Mann and R. E. Purkhiser. *Welding Journal,* v. 36, Aug. 1957, p. 790-797.

Current density, gas flow, arc length and tungsten type were found to influence arc stability when using alternating current. Straight polarity half of the alternating current wave was rectified with auxiliary equipment into direct current signal to operate present automatic control system. (K1d, 18-24; Al)

448-K. (German.) **Influence of Chemical Composition and Structure of Iron and Steel on Behavior Toward Hydrogen. Pt. I.** Friedrich Erdmann-Jesnitzer and Hans Sabath. *Archiv für das Eisenhuttenwesen,* v. 28, May-June 1957, p. 345-353.

The laws for transfer of hydrogen from arc atmosphere into the weld. The quantity of hydrogen capable of diffusing is determined for various electrodes of basic-lime and cellulosic types; different silicon content and different conditions for preparation of specimens. Silicon is found to favor hydrogen absorption and impede the release of hydrogen by alpha-iron at room temperatures. 54 ref. (K9n, N15d, 2-10; ST, *H*)

449-K. (German.) **Progress in Welding of Austenitic Steels in the Construction of Apparatus and Containers.** J. Mundt. *Technische Mitteilungen Krupp,* v. 15, June 1957, p. 29-36.

Some problems in the production of ductile welds in austenitic materials. Detailed procedures are for a welded joint of identical materials for low temperatures; a welded joint on plated material; a facing weld on alloy boiler sheet. A table gives the basic welding procedures for new materials and designs. (K general; AY, SS)

450-K. (German.) **Some Factors Influencing the Quality of Welds.** H. Sachs. *Technische Mitteilungen Krupp,* v. 15, June 1957, p. 37-46.

Heating conditions, form of specimens, hydrogen content, different types of electrodes, different length of time between passes were taken as variables, and their influence on tensile strength, strain and reduction of area was investigated. These effects may be superimposed on the varying effects of diameter of electrodes, amperage, contraction stresses and welding position. 7 ref. (K9n, K1)

451-K. (German.) **Welded Steel Tubes for Mining Shaft Construction.** W. Stroh and W. Stein. *Technische Mitteilungen Krupp,* v. 15, June 1957, p. 47-56.

Former cast tube segments can be replaced by welded and bolted steel tube segments. Special welding procedures and fixtures were developed. Forged ribs welded to the back of tubes serve as anchors in the cement filling. 27 ref. (K general, T28m, 17-7; ST)

452-K. (Japanese.) **Selection of Welding Methods and Welding Machines.** Iwao Onishi. *Metals,* v. 27, Aug. 1957, p. 601-602.

Simple illustrations of submerged arc welding, fused arc welding and tungsten inert-gas arc welding. (K1, 1-2)

453-K. (Japanese.) **Application of Automatic Arc Welding.** Takagi and Suzuki. *Metals,* v. 27, Aug. 1957, p. 617-620.

Automatic submerged-arc welding and automatic inert-arc welding in shipbuilding. (K1d, K1e, 18-24, T22)

454-K. (Norwegian.) **Trends in the Metallurgy of Arc Welding.** N. Christensen. *Teknisk Ukeblad,* v. 104, Feb. 28, 1957, p. 161-168.

Chemical and metallurgical factors in arc welding; temperature conditions; mutual reaction of bath and gas phase. Removal of hydrogen; hydrogen and temper fractures; hydrogen damage in mild steel welds. (K1, K9n; ST)

455-K. Welding of Zircaloy-2. J. G. Purchas, D. R. Harries and H. Cobb. *British Welding Journal,* v. 4, Sept. 1957, p. 412-421. (CMA)

Zircaloy-2 clad fuel elements may be arc welded successfully by using a chamber of inert gas. The welding sequence for the fuel elements is described. Welding current was 30-45 amp., depending on fusion conditions. The welds have good corrosion resistance in hot water under pressure. 8 ref. (K1d; Zr)

456-K. Welds Ti Parts in Portable Bubble. *Iron Age,* v. 180, Sept. 26, 1957, p. 142-144. (CMA)

United Aircraft uses plastic bubbles by Pioneer Valley Plastics Co. (Chicago) in welding titanium parts at its East Hartford plant. The cast vinyl plastic holds an argon atmosphere and is about 4 ft. x 4 ft. (K1d; Ti)

457-K. Electrode Quality Depends on Coating. Harry F. Reid, Jr. *Steel,* v. 141, Sept. 30, 1957, p. 83-84.

Use of different purifiers and alloying elements in electrode coatings gives versatility in properties of arc weld deposits. (K1, W29h)

458-K. Experimental Determination of Bonding Temperature. Gregory Blanc and R. D. Wasserman. *Welding Journal,* v. 36, Sept. 1957, p. 419s-422s.

Temperature measurements on three filler alloys for brazing were made with Ni/Cr-Ni thermocouple calibrated by the usual fixed points up to a temperature of 1650° F. Test methods and equipment. (K8, X9q; SGA-f)

459-K. Spot Welding 65-35 Brass on Single-Phase Equipment With Slope Control. L. E. Mills and H. C. Wolfe. *Welding Journal,* v. 36, Sept. 1957, p. 423s-428s.

Requirements for spot welding one-half hard yellow brass from the point of view of equipment, cleaning prior to welding, electrode material, welding time, electrode force, welding current, contact overlap and spot spacings. (K3n, 1-2; Cu-n)

460-K. Inert-Gas Tungsten-Arc Spot Welding of an Automotive Transmission Subassembly. W. G. Mertens and O. J. Ryder. *Welding Journal* v. 36, Sept. 1957, p. 871-876. •

Application of this process effects a multiple number of spot welds of uniform high quality and low cost. (K3n)

461-K. Boiler-Code Welding and Joint Design With the CO_2 Process. J. D. Carey, Jr. *Welding Journal,* v. 36, Sept. 1956, p. 877-880.

Evaluation of the weldability of unfired-pressure-vessel components using the carbon dioxide process. Tests were made on the welding of two grades of boiler-code steel; ASME type A285 grade C and type A212 grade B. Enumerates optimum joint preparation and welding techniques. (K9s, K9r; ST)

462-K. Welding Problems in Pressure Vessels for Nuclear Reactors. R. E. Lorentz, Jr. *Welding Journal,* v. 36, Sept. 1957, p. 881-887.

Types of equipment, materials of reactor vessels and required properties. Data on impact properties of manual metal-arc and multilayer submerged arc deposited metal; and on manual metal-arc and submerged-arc stainless-steel cladding methods. (K general, W11p)

463-K. Consumable-Electrode Inert-Gas Welding With Small-Diameter Wires. K. E. Richter and J. F. M. Essig. *Welding Journal,* v. 36, Sept. 1957, p. 893-899.

Metal transfer requirements; wire deposition rates and wire-feed speeds; constant potential and con-

ventional-type power supplies; manual and mechanized welding techniques. Relates to thin-gage stainless and carbon steels.
(K1d, 1-2; SS, CN)

464-K. (French.) **Welding in Argon Atmosphere With a Consumable Electrode.** A. Baron. *Revue Générale de Mécanique,* v. 11, July-Aug. 1957, p. 302-306.

Process patented by Société l'Air Liquide utilizes continuous consumable electrode in neutral argon atmosphere. (K1d)

465-K. (French.) **Use of Welding in Gas Works.** R. Groffier. *Soudage et Techniques Connexes,* v. 11, July-Aug. 1957, p. 205-221.

Development of oxy-acetylene welding, and subsequently arc welding, in maintenance and repair of gas works; welding in construction of storage tanks, coke plant equipment, feeders; description of hydraulic, dry and pressure-type feeders, design and fabrication of their welded components.
(K1, K2, T26n)

466-K. (French.) **Welding in Civil Engineering Equipment. Pt. I.** M. Dumas. *Soudage et Techniques Connexes,* v. 11, July-Aug. 1957, p. 223-229.

Examples of welded equipment such as traveling and other types of cranes, mechanical shovels, scrapers, steam rollers; advantages obtained by welding in construction of equipment. (K general, T4)

467-K. (French.) **Welding in Civil Engineering Equipment. Pt. 2. Applications in the Construction of Site Cranes.** L. Weitz. *Soudage et Techniques Connexes,* v. 11, July-Aug. 1957, p. 231-240.

Techniques and factors involved in welded crane construction; use of positioners and fixtures in assembly of prefabricated components; costs of welded construction compared with riveted. (K general, T4, W12q)

468-K. (French.) **Welding in the Construction of New Hall on Paris Exhibition Grounds.** R. Delesques. *Soudage et Techniques Connexes,* v. 11, July-Aug. 1957, p. 241-246.

A hall, 68 m. wide, 144 m. long, 26 m. high, supported by 200-ton steel framework consisting essentially of nine 30-m. high by 67-m. span portal frames, of all-welded construction, connected by bent and welded plate transoms. Site joints only were riveted. Welding program and details of erection at site.
(K general, T26n; ST)

469-K. (French.) **Bonding Mechanism in Braze Welding.** H. Granjon. *Soudage et Techniques Connexes,* v. 11, July-Aug. 1957, p. 247-254.

Experimental study of molten metal-base metal bonding in braze welding of ferrous metals using silicon brass as filler. Weld metal was eliminated, without corrosive effect on base metal, by dissolution in nitric acid. Micrographic study was then made of molten-metal base metal contact plane to determine structural effects of diffusion during braze welding. It was found that bonding is effected by a twofold process, infiltration of ferrite grain boundaries and diffusion into austenite. Diffusion is accompanied by decrease in apparent carbon content. 7 ref. (K6q)

470-K. **The Works Engineer's Approach to Welding.** F. H. Dorney. *Australasian Engineer,* v. 50, Aug. 7, 1957, p. 52-57.

Suggested systematic approach designed to assist works engineer, who may or may not be familiar with welding, in promoting efficiency of welding work; method of analyzing costs of welding and equipment in order to obtain best over-all results. 6 ref. (K general, 17-3)

471-K. **Ultrasonic Iron Solders Aluminum.** Thomas J. Scarpa. *Electronics,* v. 30, Oct. 1, 1957, p. 168-169.

Oxide layer on metal is removed by electrically driven iron tip. Sonic field abrades surface of metal while molten solder forms alloy bond before further oxidation can take place. Work surface is heated by electric tip or gas torch.
(K7h; Al)

472-K. **Six Basic Steps to Good Silver Brazed Joints.** *Industrial Heating,* v. 24, Aug. 1957, p. 1554-1560, 1662.

Steps are good fit, clean metal, proper fluxing, supporting of parts, heating and flowing alloy and final cleaning. (K8, *Ag*)

473-K. **Paste Filler Metal Gives Dip Brazing a Boost.** A. M. Setapen. *Iron Age,* v. 180, Sept. 12, 1957, p. 136-138.

Procedure for precleaning, brazing, flux removal in brazing aluminum alloy assemblies with paste filler and dip brazing equipment.
(K8n; Al)

474-K. British Approach to Honeycomb Production. Some Comparisons Between British and American Practice. Peter Trippe. *Metalworking Production,* Aug. 30, 1957, p. 1503-1509.

British inventors consider present American methods too complicated. Dufaylite (British platent holders) pre-forms compound curves by ingenious method of varying glue line, which eliminates machining of expanded honeycomb per American practice. British claim to be ahead in techniques for producing airfoil sections, building large sections, in special methods for aluminum honeycomb, automatic and semi-automatic equipment for quantity production, laminating techniques. It is conceded that American firms are ahead on stainless steel and brazed sections in general.
(K12; Al, SS, 7-9)

475-K. Magnesium Castings Can Be Welded Without Distortion. H. Mansfield and L. Gesualdo. *Product Engineering,* v. 28, Sept. 16, 1957, p. 94-95.

Spraying deposition of weld metal in welding castings with consumable electrodes and argon-shielded arc resulted in sound welds.
(K1d; Mg, 5)

476-K. Brazing Filler Metal. Pt. 1, 2, 3. *American Machinist,* v. 101, Oct. 7, 1957, p. 147-151.

Application, composition and brazing temperature range for aluminum-silicon, copper-phosphorus, silver, copper-gold, copper-zinc, magnesium and nickel-chromium types of brazing alloys. (K8; SGA-f)

477-K. Some Welding Developments Applicable to the Fabrication of Heavy Pressure Vessels for Nuclear Power Stations. J. A. Lucey, A. H. B. Swan and P. F. Wilks. *British Welding Journal,* v. 4, Oct. 1957, p. 449-457.

Manipulators enable automatic welding of spherical vessels; downhand welding of heavy plates at exceptionally high speeds using multipower tandem welding; new semiautomatic processes, and a new low-hydrogen rutile-iron-powder electrode for manual welding. 6 ref.
(K general, W11p)

478-K. Fabrication, Erection, and Welding of the Dounreay Sphere. J. McLean and J. A. Forrest. *British Welding Journal,* v. 4, Oct. 1957, p. 457-466.

(K general, T26q)

479-K. Fabrication of Special Equipment for the Nuclear Energy Industry. C. A. Terry, N. H. Shuttleworth and D. C. Moore. *British Welding Journal,* v. 4, Oct. 1957, p. 466-474.

Several examples of fabricated components made for atomic fuel processing plant, for the gas-cooled reactor at Calder Hall, and for the DIDO research reactor. Materials of construction, the joining processes adopted, and means of obtaining the high standards of joint quality required. (K general, W11p)

480-K. Welding Problems in Future Reactors. I. H. Hogg. *British Welding Journal,* v. 4, Oct. 1957, p. 482-488.

Components of nuclear reactors of interest to the welding engineer are the fuel container, the core vessel, the external circuit and heat exchangers, and the enclosing vessel or building. Problems involved include the welding of special materials and thick pressure vessels. Possible repair of reactors under radioactive conditions.
(K general, W11p)

481-K. No Flux for Aluminum. *Chemical and Engineering News,* v. 35, Oct. 28, 1957, p. 47.

New process to solder aluminum lifts oxide and wets metal without the aid of flux. (K7; Al)

482-K. Brazing Stainless Honeycomb Pane for Convair Supersonic Aircraft. Charles E. Rorick. *Industrial Heating,* v. 24, Oct. 1957, p. 1070-1078.

A new Holcroft brazing furnace for sandwiching metallic foil cores between very thin sheets of 17-PH stainless steel. (K8j, 1-2; SS, 7-9)

483-K. Brazing of Sandwich Structures in High-Temperature Vacuum Furnace. Phal Fair. *Industrial Heating,* v. 24, Oct. 1957, p. 1981-1986.

North American Aviation, Inc., has recently installed one of the world's largest cold wall vacuum furnaces for brazing honeycomb sandwich structures. Rectangular in shape, this furnace has a high temperature and vacuum range.
(K8j, 1-2, 1-23, 7-9)

484-K. Solar Aircraft Honeycomb Structures Brazed in Unique Elevator-Type Furnaces. *Industrial Heating,* v. 24, Oct. 1957, p. 1991-1994, 2004.

Two new furnaces are believed to be the first such units specifically developed for the high-temperature brazing of all-metal honeycomb structures. (K8j, 1-2, 7-9)

485-K. What the Russians Are Doing With Welding. Henry Brutcher.

Industry and Welding, v. 30, Oct. 1957, p. 48-54, 94.

Russian developments including magnetic tape flaw detection and CO_2 shielded welding techniques; welding specifications and data. (K general)

486-K. Preheating: Where and How to Use It. H. J. Nichols. *Industry and Welding,* v. 30, Oct. 1957, p. 80-81, 83.

Advantages of preheating before welding of carbon or alloy steels. (K9p; CN, AY)

487-K. What It Takes to Weld Aluminum. Pt. 2. *Marine Engineering Log,* v. 62, Oct. 1957, p. 98, 99, 175.

Tungsten-arc, carbon-arc, atomic hydrogen methods; general conditions to be observed to obtain sound welds. (K1; Al)

488-K. New Powdered Alloy Simplifies Aluminum Brazing. A. M. Setapen. *Modern Metals,* v. 13, Sept. 1957, p. 40-44.

Brazing alloy containing 88% aluminum and 12% silicon powdered and combined with flux cement eliminates need for preplacing of filler metal in aluminum assemblies to be brazed. (K8; Al, SGA-f)

489-K. Look What's Happening to Honeycombs. *Steel,* v. 141, Oct. 14, 1957, p. 116-119.

Core machining, cleaning, sandwich assembly, brazing and heat treatment of stainless steel honeycomb. (K8, G17, J general; SS, 7-9)

490-K. Brazing Alloy Selector. *Steel,* v. 141, Oct. 7, 1957, p. 162-165.

Applications, trade names, compositions, melting ranges of 400 brazing alloys of aluminum-silicon, copper phosphorus, silver, copper-gold, copper-zinc, magnesium and nickel-chromium alloy types. (K8; SGA-f)

491-K. Welding of Cans for Titanium Extrusions. E. F. Bulson. *U. S. Atomic Energy Commission,* Knolls Atomic Power Laboratory, KAPL-M-AME-4, Jan. 22, 1957, 13 p. (CMA)

The application development is described for the welding of titanium triflutes, cruciforms and rectangular containers of various thicknesses. An inert arc method in a welding dry box with automatic control of voltage was used. A graph is shown for maintaining controlled weld penetration. (K1d, F24; Ti, 8-16)

492-K. Guided Bend Test as a Means of Qualifying Butt Welds in Zircaloy-2 and 3. S. A. Toftegaard. Knolls Atomic Power Laboratory, *U. S. Atomic Energy Commission,* KAPL-M-SAT-4, Apr. 5, 1957, 11 p. (CMA)

Pre-weld annealing of Zircaloy-2 and 3 permitted good butt welds to be bent 180°. Increasing the helium purity of the protective atmosphere did not, nor did increasing the bend radius. Welds in cold rolled Zircaloy made with higher heat input to widen the heat affected zone allowed bends to specification. (K9r, K1d; Zr)

493-K. Temperature Measurements at the Metal Cutting Tip-Shank Interface. W. O. Woods. Watertown Arsenal. *U. S. Office of Technical Services,* PB 131004, May 1956, 18 p. $.50.

Determined the machining temperatures which adhesives must withstand for effective bonding of cutting tool tips to tool shanks; temperatures were measured at the metal cutting tip-shank interface for ceramic as well as cemented carbide and high speed toolsteel cutting materials. (K12, 2-12; TS, SGA-j)

494-K. Brazing for Greater Productivity. Pt. 1. G. M. A. Blanc and Rene D. Wasserman. *Welding Engineer,* v. 42, Oct. 1957, p. 42-44.

Variation in tensile strength, melting time and price with bonding temperature of silver alloy filler metals used in silver brazing. (K8; Ag, SGA-f)

495-K. Filler Metals for Joining. Orville T. Barnett. *Welding Engineer,* v. 42, Oct. 1957, p. 56-61.

Mechanical properties of joints and chemical composition of filler metals for welding aluminum and aluminum alloys by means of inert-gas metal arc welding, inert-gas tungsten arc welding, metal-arc, oxyacetylene or atomic hydrogen. (K1, K2; SGA-f)

496-K. Shielding Gases for Inert-Gas Welding. W. H. Helmbrecht and G. W. Oyler. *Welding Journal,* v. 36, Oct. 1957, p. 969-979.

Recent developments and recommendations on best shielding gas for all metals of commercial importance. Arc characteristics, flow rate and weld quality. 3 ref. (K1d; EG-m, RM-g)

497-K. (German, French, Spanish, English.) **Resistance Welding of Stainless Steel.** *Aciers Fins and Speciaux Francais,* no. 26, July 1957, p. 58-61.

Principles and application; dimensions of electrode tips and adjust-

ment of machines for spot, projection or roller spot welding.
(K3; SS)

498-K. (German.) **Experience With Basic Electrodes in Finland.** Olavi Eiro. *Schweissen und Schneiden,* v. 9, Aug. 1957, p. 379-381.

Welding boilers; preparing welds for application in sea water; notch impact strength of welds.
(K1, W29h)

499-K. (German.) **Efficient Torch Soldering.** H. H. Grix. *Schweissen und Schneiden,* v. 9, Aug. 1957, p. 381-385.

Testing solders and fluxes; design of soldered joints; automatic and semi-automatic devices. (K7c)

500-K. (German.) **Fisheyes in Steel Welds.** W. Hummitzsch. *Schweissen und Schneiden,* v. 9, Sept. 1957, p. 386-391.

Causes; investigation of the mechanism of formation by means of supersonic wave testing; reduction of hydrogen content of welds. 6 ref.
(K general; ST, 9-20)

501-K. (German.) **Welding Railroad Track by Oxy-Acetylene Torch.** W. Kilbert. *Schweissen und Schneiden,* v. 9, Sept. 1957, p. 425-429.

Advantages of oxy-acetylene welding; hard facing rails; construction and maintenance of oxy-acetylene welded rails; cost calculations. 5 ref. (K2h, T23q)

502-K. (Russian.) **Effect of Welding on the Properties of Heat Treated Rimmed Steel.** A. S. Astafev. *Stal',* v. 17, Feb. 1957, p. 158-162.

Preliminary hardening with subsequent tempering improves the properties of the metal. When welded according to recommendation, the joint has satisfactory mechanical properties at temperatures below zero. 4 ref.
(K general, Q general, 1-13; ST-d)

503-K. (Spanish.) **Fabrication of Oil Pipe Lines by Means of Welding.** C. Deutsch. *Ciencia y Tecnica de la Soldadura,* v. 7, July-Aug. 1957, 5 p.

Improvements in manufacture of welded pipe and in methods of welding pipe lines, together with proper organization of work in the field, make possible savings of time and money in welded construction of lines. (K general, T26r)

504-K. (Spanish.) **Arc Welding Carbon Steels in CO_2 Atmosphere.** Celso Penche Felgueroso. *Ciencia y Tecnica de la Soldadura,* v. 7, July-Aug. 1957, 12 p.

Program of experimentation on Spanish steels. Theory and practice of technique and description of equipment used, on basis of U. S., British, French and Russian experience. 20 ref. (K1d; ST)

505-K. (German.) **Bonding of Metals.** G. Holzberger. *Adhäsion,* no. 4, July-Aug. 1957, p. 147-150.

Various new bonding methods and adhesives applicable to metals.
(K5, K12)

506-K. (German.) **Sigma Welding.** H. Ernenputsch. *Industrie-Anzeiger,* v. 79, July 19, 1957, p. 879-881.

Theory, equipment, method, application, economy and advantages of shielded inert-arc welding in comparison with other methods. (K1d)

507-K. (German.) **Induction Soldering.** K. R. Pawlowitz. *Technik und Betrieb,* v. 9, June 1957, p. 21-22.

Economy and simplicity in various applications. (K7e)

508-K. (Japanese.) **Brazing.** Keiichi Mizuno. *Sumitomo Metals,* v. 9, Apr. 1957, p. 40-47.

Bronze solder is unsuitable for joining Albrac (aluminum brass) tube owing to weakening of joint members at the high temperature necessary for the brazing operation. A good joint was obtained with silver solder alloy of 30-50% Ag, 10-25% Cd, 15-25% Zn.
(K8; Cu, *Al,* SGA-f)

509-K. (Japanese.) **Welding of Al and Its Alloys.** Toshio Amitani. *Sumitomo Metals,* v. 9, Apr. 1957, p. 48-52.

Bending, hardness and corrosion tests on argon gas tungsten arc welded wrought aluminum alloys.
(K1; Al)

SECTION L

CLEANING, COATING and FINISHING

1-L. Electroplating on Beryllium. J. G. Beach and C. L. Faust. *Industrial Finishing (London),* v. 9, Oct. 1956, p. 173-174.

The flow sheet shows the over-all operations used to electroplate on beryllium. Eight variations in the preliminary preparation were used without noticeable effect on the adhesion. The recommended procedure contains several precautionary operations that have not been fully evaluated. (L17; Be)

2-L. Selecting Electroplates for Iron Powder Parts. W. H. Safranek and M. W. Wirth. *Materials & Methods,* v. 44, Nov. 1956, p. 104-109.

A comprehensive investigation, where specific recommendations on bath formulations and detailed data are given on appearance, thickness and uniformity, salt spray resistance and humidity resistance.
(L17; Fe, 8-21, Cd, Zn, Cu, Cr, Ni)

3-L. Cleaning Metals and Alloys. C. B. F. Young. *Metal Finishing,* v. 54, Nov. 1956, p. 56-59, 65.

Alkaline cleaners, wetting agents, nonionic surface active agents, typical cleaning processes, simplifying the cleaning process.
(L12; Cu, Fe, Zn, Pb, Sn)

4-L. How to Clean Die Castings Before Finishing. T. Murray. *Precision Metal Molding,* v. 41, Nov. 1956, p. 73-74.

Mechanical, solvent, and alkaline cleaning systems. (L10, L12; 5-11)

5-L. Calorizing of Gas-Turbine Blades of Austenitic Steel. V. I. Prosvirin, A. I. Fedosov and Yu. S. Myakishev. *Henry Brutcher Translation No.* 3805, 8 p. (From *Metallovedenie i Obrabotka Metallov,* v. 2, no. 4, Apr. 1956, p. 50-56.) Henry Brutcher, Altadena, Calif.

Previously abstracted from original. See item 536-L, 1956.
(L15; Al, AY)

6-L. Effect of Ultrasound Upon Electro-Deposition of Metals. A. Roll. *Henry Brutcher Translation No.* 3826, 8 p. (Abridged from *Metalloberflache,* v. 10, no. 8, 1956, p. 230-233.) Henry Brutcher, Altadena, Calif.

Previously abstracted from original. See item 663-L, 1956.
(L17, W3; Ni, Ag, Cr)

7-L. (Czech.) **Electrolytic Polishing of Metals.** Ivan Hrivnak. *Hutnické Listy,* v. 11, no. 10, Oct. 1956, p. 599-611.

Explains Jaquet-Rocquet theory and mechanism of polishing polyphase structures. (L13p)

8-L. (Dutch.) **Hard Surfacing of Wear Resistant Metal Surfaces.** P. G. Weeber, J. W. Mey and Th. Berkhout. *Smit Mededelingen,* v. 11, no. 3, July-Sept. 1956, p. 69-77.

Preferred type of hard surfacing metal, method of welding, measurement of wear resistance.
(L24, Q9; SG-m)

9-L. (French.) **Porosity Dispersion in Electrolytic Coating.** Maurice Bonnemay. *Journal de Chimie Physique,* v. 53, no. 9, Sept. 1956, p. 688-690.

Experimental data permit drawing of the frequency curve characterizing the porosity distribution of an electrolytic coating. The curve is projected by an extrapolation formula as a function of the thickness.
(L17; 9-18)

10-L. (French.) **The Kanigen Nickel Plating Process.** Grégoire Gutzeit. *Revue de l'Aluminium,* v. 33, no. 235, Sept. 1956, p. 804-809.

Processes give interesting results on aluminum, providing very hard and protective coatings on pieces of any shape. (L28; Al, Ni)

11-L. (German.) **Studies of the Mechanism of Brightening of Aluminum**

and Aluminum Alloys. II. F. Baumann and H. Ginsberg. *Aluminium,* v. 32, No. 11, Nov. 1956, p. 706-711.

Reactions of aluminum with the Erftwerk brightening bath; chemical nature of brightened aluminum surfaces. (L13; Al)

12-L. (German.) **Structure of Sprayed Metal Layers.** A. Matting and W. Raabe. *Schweissen und Schneiden,* v. 8, no. 10, Oct. 1956, p. 369-374.

Optical, photographic and caloric determination of temperature at spraying jet; deformation and coherence in sprayed layers. (L23, X9)

13-L. (Russian.) **Proportion Between the Solution Composition and Precipitate in the Electrodeposition of Two-Component Alloys.** E. I. Akhumov and B. Ia. Rozen. *Doklady Akademii Nauk SSSR,* v. 109, no. 6, Aug. 21, 1956, p. 1149-1151.

Theoretical formulas verify the experimental data. (L17)

14-L. **Properties, Specifications, Tests and Recommendations for Coal Tar Coatings. II. Cold Applied Coatings.** W. F. Fair, Jr. *Corrosion,* v. 12, Dec. 1956, p. 605-610.

Surface preparation, types and characteristics of coatings; selection of primer; water vapor permeability; recommendations for protection in more corrosive atmospheres. (L26a)

15-L. **The Use of Hot-Dip Strippable Coatings for the Protection of Spares.** F. A. S. Wood and N. R. Kirkby. *Corrosion Technology,* v. 3, Nov. 1956, p. 355-356.

Easily applied coatings of tough, rubbery plastic give complete protection against corrosion and abrasion. (L26p)

16-L. **Hardness of Electrodeposited Tin-Nickel Alloy on Brass.** V. R. Ramanathan. *Institute of Metal Finishing, Bulletin,* v. 6, Autumn 1956, p. 1-7.

Hardness determined by the microindentation technique. Thickness of coating is 16 times the depth of penetration. (L17, Q29q, S14b; Cu, Sn, Ni, 8-12)

17-L. **The Influence of Some Process Variables on the Reflectivity and Surface Appearance of Electrolytic Tinplate.** R. Mills. *Institute of Metal Finishing, Bulletin,* v. 6, Autumn 1956, p. 8-17.

Increasing the temperature of the electrolyte and the relative cathode-electrolyte velocity results in an extension of the upper limit of current density at which acceptable coatings are produced. (L17b; Sn)

18-L. **Plating of Tungsten by an Oxidation-Reduction Cycle.** M. G. Charlton and G. L. Davis. *Institute of Metal Finishing, Bulletin,* v. 6, Autumn 1956, p. 28-39.

Tungsten is deposited by holding a tungsten source at high temperature in an atmosphere of hydrogen and water vapor with the body to be plated close to the tungsten and heated to above 700° C. (L25; W)

19-L. **High Speed Tinning Line Has Unique Features.** J. W. Brinks. *Iron and Steel Engineer,* v. 33, Nov. 1956, p. 133.

Trouble shooting in the controller is simplified through use of a new memory-type fault finder which instantly detects and remembers location of circuit faults. High power density of 200 kw. per ft., coupled with fast response scanner regulator equipment, works to assure that exactly the right amount of power is applied to the strip for flowing the tin. (L16, X10; Sn)

20-L. **Batch Anodizing.** M. Flusin. *Metal Industry,* v. 89, Nov. 16, 1956, p. 413-416.

Designs evolved for baskets, maintenance of satisfactory electrolyte temperature, preparatory treatment, bath conditions, drying and sealing, and arrangement of parts in the containers. (L19, 17-2)

21-L. **Comparison of Finishes for Aluminum.** Walter E. Pocock. *Metal Progress,* v. 70, Nov. 1956, p. 96B.

Data sheet comparing electrolytic and chemical conversion processes with regard to properties of coating, treatment and equipment. (L14, L17; Al)

22-L. **Finishes for Aluminum Alloys. II. Chemical or Conversion Coatings.** Walter E. Pocock. *Metal Progress,* v. 70, Nov. 1956, p. 97-101.

Coatings formed by chemical reaction of aluminum with chromate solutions provide excellent resistance to corrosion and good bases for paint. They are inexpensive to produce and have replaced anodic coatings in many applications. (L14c; Al)

23-L. **Sodium Hydrides Descaling Process.** W. F. S. Taylor. *Metal Treatment and Drop Forging,* v. 23, Nov. 1956, p. 465-468.

Principles and applications of descaling equipment. (L12n)

24-L. (German.) **Cold Galvanizing With Zinc Dust Pastes.** K. Zimmermann. *VDI Zeitschrift,* v. 98, no. 30, Oct. 1956, p. 1727-1728.

Protection against corrosion by coating with this commercial zinc-paste (94% zinc-dust). (L29; Zn)

25-L. Electrolytic and Chemical Methods of Metal Brightening. H. Silman. *Birmingham Metallurgical Society, Journal,* v. 37, Sept. 1956, p. 417-430.

Theoretical considerations, tanks and racks, applications, methods used on stainless steels, chromium iron and aluminum.
(L12, L13,p; SG-g, SS, Al)

26-L. Nickel Electroforming. Dodd S. Carr. *Plating,* v. 43, Dec. 1956, p. 1422-1429.

Design, fabrication and preparation of molds, selection of plating solution, building up nickel on the mold, improvement in plating baths, mold removal, machining and grinding, applications. (L18, Ni)

27-L. (Czech.) **Mechanical Descaling of Wire.** Stanislav Hajek. *Hutnik,* v. 6, no. 9, Sept. 1956, p. 271-275.

Descaling by pickling is being replaced by mechanical descaling. Description of various mechanical descaling equipment. Economic considerations. (L10, W2; ST, 4-11)

28-L. (German.) **Chemical Polishing of V2A-Steel With Gases.** G. Schmid, E. Maurer and H. Steinhausen. *Metalloberfläche,* v. 10, no. 10, Oct. 1956, p. 289-295.

Application of nitrogen dioxide, hydrogen chloride and steam for steel polishing. Optimum procedures and temperature. (L12j; ST)

29-L. (German.) **Processes During Chemical and Anodic Polishing of Metal Surfaces.** Helmut Brünner. *Metalloberfläche,* v. 10, no. 10, Oct. 1956, p. 295-299.

Requirements of electrolytes for polishing, comparison of chemically polished and electrochemically polished surfaces. Practical applications. (L12, L13p)

30-L. (German.) **Investigation of the Anodic Process of Aluminum Electropolishing by Means of Perchloric Acid-Alcohol Electrolytes.** V. Hansen and E. Knuth-Winterfeldt. *Metalloberfläche,* v. 10, no. 10, Oct. 156, p. 229-300.

Experimental findings and two hypotheses of the reaction mechanism. (L13p; Al)

31-L. (German.) **Protection of Metal Surfaces by Coatings.** R. Endres. *Metalloberfläche,* v. 10, no. 11, Nov. 1956, p. 321-326.

The need for anticorrosive coating of iron and steel structures. Physically and chemically drying paints, their properties and effects. Preparation of the metal surface before coating. Painting methods.
(L26n; ST)

32-L. (German.) **Making and Testing Silvered Copper Wires.** A. Keil. *Metalloberfläche,* v. 10, no. 11, Nov. 1956, p. 327-329.

Advantages and disadvantages of dip coating and other methods. Adherence and other coating properties. (L16, L17; Ag, Cu, 4-11)

33-L. (Russian.) **Galvanic Plating of Radiation Tubes With a Lead-Tin Alloy.** S. L. Voskoboinik. *Vestnik Mashinostroeniia,* v. 36, no. 10, Oct. 1956, p. 59-60.

New method eliminates health hazards and forms a high-quality plating. (L17, A7; Pb, Sn)

34-L. (Book.) **Metallizing Bibliography.** 35 p. 1956. American Welding Society, 33 West 39 Street, New York 18, N. Y.

References are primarily on equipment, process, application, testing, theory, and cost.
(L23, L24; Sn, Pb, Zn)

35-L. (Book.) **Some Recent Advances in Tinplate Manufacturing Processes.** W. E. Hoare. 27 p. 1955. Tin Research Institute, Fraser Road, Perivale, Greenford, Middlesex, England.

Characteristics of steel base; annealing; electrolytic and hot-dip tinning; coating weights; tinplate in coil; testing methods.
(L16, L17,J23; Sn, ST)

36-L. (Book.) **Surface Treatment and Finishing of Aluminum and Its Alloys.** S. Wernick and R. Pinner. 580 p. 1956. Robert Draper Ltd., 85 Udney Park Road, Teddington, Middlesex, England. $11.75.

Includes information on protective and decorative finishes, such as anodizing, dyeing, electrodeposition, and conversion coatings, mechanical surface treatments and finishes, electrolytic and chemical polishing, cleaning, hard chromium plating, organic finishing, vitreous enameling, and metal spraying. (L general; Al)

37-L. (Book.) **Vacuum Deposition of Thin Films.** L. Holland. 541 p. and 25 plates. 1956. John Wiley & Sons, 440 Fourth Ave., New York, N. Y. $10.00.

Plant design, film production, and physical properties of thin films.
(L25; 14-12)

38-L. (Book—German.) **Anodic Oxidation of Aluminum.** Walther W. G. Hübner and A. Schiltknecht. 407 p. 1956. Aluminium-Verlag, Düsseldorf.

A handbook based on practical experience, including useful infor-

mation on chemical and electropolishing, dyeing, equipment and its use, and grinding in preparation for oxidation. (L19, L12, L13; Al)

39-L. Latest Equipment Displayed at Metal Finishing Show. *Automotive Industries,* v. 115, Dec. 15, 1956, p. 70-72.

Display of coated abrasive equipment at Metal Finishing Show; use of coated abrasives for polishing metal parts having difficult contours. (L10b; NM-j)

40-L. Pickle Liquor Recovery. *Chemical and Engineering News,* v. 35, Jan. 7, 1957, p. 64-65.

New processes eliminate waste problem, keep acid content of pickling bath uniform, increase pickling capacity, reduce sulphuric acid consumption. (L12g, A8b)

41-L. Protecting Steel From Rust: Results of Surface Treatment Tests. *Corrosion Technology,* v. 3, Dec. 1956, p. 393-396.

Pretreatment of surface prior to painting to remove or neutralize rust is recommended. (L10, L12, R11)

42-L. New Hot-Dip Galvanizing Plant. *Corrosion Technology,* v. 3, Dec. 1956, p. 397-399.

Ideal Casements Ltd. plant at Reading, England, incorporates several new ideas. (L16, 10-5, Zn)

43-L. Yorkshire Firm's Pickling and Painting Plant. *Corrosion Technology,* v. 3, Dec. 1956, p. 400.

Equipment and processes of the Rose Mount iron works of Robert Dempster and Sons Ltd. (L12g, L26n, W3, 10-5; Fe)

44-L. Automatic Cleaning Unit Adapted to Job Shop Use. Eugene F. Anderson. *Foundry,* v. 85 no. 1, Jan. 1957, p. 224-226.

Abrasive blasting for castings unsuitable for tumbling. (L10c; 5)

45-L. Hard-Facing Doubles the Life of Coal Crusher Teeth. *Linde Tips,* v. 36, no. 1, Winter 1957, p. 18.

Cobalt-chromium-tungsten rod is used for hard-facing new teeth, chromium-magnesium-iron rod for rebuilding worn and broken teeth. (L24, W15; AY; 18-22)

46-L. Protecting Molydenum at High Temperatures. J. J. Harwood. *Materials and Methods,* v. 44, No. 6, December 1956, p. 84-89.

The reason for molybdenum protective coating for high temperature. Methods of coating; (1) electrodeposited coating such as nickel plate, chromium plate, and chromium-nickel plate; (2) cladding; (3) sprayed metal coating; (4) diffusion coating; (5) molybdenum disilicate coating; (6) ceramic coating. Results of oxidation rate with temperature, time and thickness of coatings. (L general, 2-12; Mo)

47-L. Acrylic Coatings for Metal Products. Gerould Allyn. *Materials and Methods,* v. 44, no. 6, Dec. 1956, p. 106-109.

Clear lacquers and pigmented enamels are used to preserve attractive metallic surfaces, protect electronic circuits from moisture, protect chemical and food processing equipment and provide a finish that maintains its color at elevated temperatures. (L26p)

48-L. Fast. .Hard. .Ductile Chrome Plate. *Modern Metals,* v. 12, Dec. 1956, p. 76-77.

Wide range of uses for "Hardalume" processed metal; process deposits chromium directly on aluminimum. (L17; Al, *Cr*)

49-L. Finishes for the Bottle Crown Industry. Part 2. Application Controls and Testing Procedures. Louis F. Rogers. *Organic Finishing,* v. 17, Dec. 1956, p. 5-9.

Quality control in the application of size, enamel and varnish coating to bottle crowns. (L26n)

50-L. Variables Affecting Coating Performance. Part 3. John I. Richardson. *Organic Finishing,* v. 17, Dec. 1956, p. 10-11, 21.

Ease of handling, flexibility, maintenance and costs. (L26, 17-2)

51-L. Laboratory Control of Color Anodizing Process. Frank P. Stiller. *Plating,* v. 43, Dec. 1956, p. 1419-1421.

Analytical procedures for electrolyte dye solution and sealing bath. (L19, S11)

52-L. New Directions for Porcelain Enamel. *Steel,* v. 139, Dec. 3, 1956, p. 142, 147.

New developments in enameling on aluminum and aluminized steel consist of low-temperature frits, convection heated furnaces and electrostatic spraying. (L27, Al, ST)

53-L. Descaling Titanium Sheet. W. J. Barth. *Steel,* v. 139, Dec. 31, 1956, p. 62-63. (CMA)

Du Pont laboratory tests which studied an oxidizing fused caustic bath for removing inert scale on titanium sheet. The descaling time at 800° F. varies from ¾ to 10 min.; attack on the base metal is low and hydrogen adsorption is slight. Straight caustic soda is too severe but the dilution with sodium nitrite and nitrate (8%) slows attack. Temperatures over 800° F. should be avoided. Additives to minimize sheet firing were investigated. (L12n; Ti, 4-3)

54-L. (French.) **Surface Treatments for Zamaks.** *Fonderie,* No. 129, Oct. 1956, p. 418.

Baths for cleaning, brightening and coloring Zamak zinc alloys which have become corroded on storage. (L12; Zn)

55-L. Stress in Electrodeposits. R. Pinner. *Electroplating and Metal Finishing,* v. 9, Dec. 1956, p. 391-396.

Causes, methods of measurement, normal values obtained in different types of plating solutions, effects of substrate, deposit thickness, solution composition and impurities. (To be continued.) (L17b, Q25)

56-L. Operation Units and Unit Phases in Electroplating. J. M. Alameda. *Electroplating and Metal Finishing,* v. 9, Dec. 1956, p. 397-399.

Breakdown of operations into operation units and unit phases would facilitate development of new products and processes and simplify application, and cost estimation. (L17, A5c, 17-3)

57-L. Cleaning by Ultrasonics. J. Lomas. *Machinery Lloyd (Overseas Edition),* v. 28, Dec. 8, 1956, p. 94-96.

Effect of ultrasonics is largely owing to the mechanical scrubbing action from the enormous number of microscopic bubbles which form and immediately collapse. One of its greatest advantages is that it reaches surfaces not easily accessible. (L10f)

58-L. Surface Treatment of Titanium. H. Richaud. *Metal Industry,* v. 89, Dec. 14, 1956, p. 496-497. (CMA)

The surface treatments necessary for successful electrodeposits on titanium discussed. Pickling is the first operation and three processes are available: HF-HCl and HF-HNO_3 solutions and molten NaOH-4%$NaNO_3$ (Virgo). Solvent degreasing, generally with trichloroethylene, follows. Anodizing may now be performed using sulphuric or phosphoric acid baths; the color obtained varies with electrolysis time. For electrodeposition of copper, chromium, nickel brass, silver or cadmium, another pickling and an anodic etch are required. Uses of electrodeposited titanium are outlined. (L general; Ti)

59-L. Conservation of Nickel in Electroplating. V. L. McEnally, Jr., and F. G. Brune. *Metal Progress,* v. 70, Dec. 1956, p. 89-96.

One third of the nickel used in electroplating would be saved if deposits of uniform thickness could be obtained. Some techniques for improving uniformity are described. (L17b, A11; *Ni*)

60-L. Continuous Parts Plating. *Production,* v. 39, Jan. 1957, p. 104-105.

Ornamental die castings are manually loaded onto plating carriers according to a pre-established loading pattern for continuous automatic cycling through successive tanks. (L17, 18-24, 1-11)

61-L. Cleaning and Finishing Forum on Technical Progress. *Steel,* v. 140, Jan. 7, 1957, p. 374-384.

Twenty-six authorities in the field contribute brief comments on important developments. A few trends mentioned are changing application procedures reduce material wasted, procedures become more automatic, improved electrostatic painting equipment. (L general)

62-L. (German.) **Merits of Lacquered Sheet Metal Cans in Relation to the Annealing Temperature of the Lacquer.** J. Herrmann and B. Mueller. *Die Technik,* v. 11, Nov. 1956, p. 773-776.

Importance of annealing temperature and time as applied to the application of the base lacquer in relationship to the subsequent application of the cover lacquer of tin cans. (L26n, 2-14)

63-L. Pickling of Stainless Steel. *American Machinist,* v. 101, Jan. 14, 1957, p. 145.

Procedures and five different pickling solutions. (L12g; SS)

64-L. Ceramic Coating of Molybdenum Offers High Temperature Uses. *Aviation Week,* v. 66, Jan. 14, 1957, p. 75. (CMA)

Elraco Engineering Co. (Hoboken) has a "hot-coining" process for producing a protective ceramic coat on molybdenum which permits suf-

ficient ductility to operate in a gas turbine. The pressed molybdenum powder preform is dipped in a liquid ceramic and then heated to 2350° F. The coated part, still hot, is then swaged, causing a forced diffusion of the ceramic into the metal. Final "uncoined" ceramic is baked on afterward to bridge any discontinuities. The process, still in the laboratory stage, was developed in cooperation with the Powder Metallurgical Laboratory of Stevens Institute. (L27; Mo)

65-L. Enameling of Zirconium. J. Schultz, et al. *Chemical Engineering Progress Symposium Series,* no. 19, 1956, p. 99-104. (CMA)

Enamels for zirconium were developed which matured either below or above the zirconium transformation point. They were adherent, craze-free, and had low thermal-neutron-absorption cross sections. Frits were based on the $BbO-SiO_2$ system. The rolled zirconium tends to cause crazing in the enamel because of nonuniform contraction on cooling; the crazing tendency is eliminated by a heat treatment. The enamel confers oxidation resistance in air for 1000 hr. at 600° C., and resistance to molten lead at 345° C. and liquid bismuth at 600° C. (L27; Zr)

66-L. Chemical Surface Preparation of Steel Prior to Painting. H. E. Patterson. *Corrosion,* v. 13, Jan. 1957, p. 77-84.

Advantages and disadvantages of various types of cleaning. Methods include solvent cleaning, alkali cleaning, emulsified solvent cleaning, steam cleaning, and acid cleaning. Also included are pickling, treating of pickled metal, use of inhibitors in pickling, and use of phosphate coatings. (L12; ST)

67-L. Red Lead in the Protection of Iron and Steel (3). H. Masseille. *Corrosion Protection & Control,* v. 3, Dec. 1956, p. 42-44; disc., p. 52.

Characteristics of red lead coating and application to ships. (L26c; ST, CI, *Pb*)

68-L. Metallic Lead Pigment for Marine Anticorrosion Paints (2). J. R. Surridge. *Corrosion Prevention & Control,* v. 3, Dec. 1956, p. 49-52.

Uses and advantages of metallic lead paints. 2 ref. (L26n, R4)

69-L. New Line Plates Contoured Parts With Few Rejects. Herbert Chase. *Iron Age,* v. 179, Jan. 10, 1957, p. 64-65.

Procedure for successfully plating zinc alloy die castings with copper, nickel and chromium in single line. Method gives less than 2% rejects. (L17; Zn, *Al, Ni, Cr,* 5-11)

70-L. Can Sealers Fill Your Fabricating Needs? R. K. Humke. *Iron Age,* v. 179, Jan. 17, 1957, p. 84-86.

Elastomers and synthetic resins for sealers against water, air, dust, oils—their applications and characteristics. (L26p, L26r, K12; NM-d)

71-L. Grit Blasting: An Aid to Carburizing Quality. A. J. Schwarzkopf. *Iron Age,* v. 179, Jan. 24, 1957, p. 71-72.

Surface appearance of complex parts following grit blasting gives visual indication of decarburization and case leakage. (L10c, Q29, J4a; ST)

72-L. Protecting Steelwork. *Iron and Steel,* v. 30, Jan. 1957, p. 31-32.

Coke plant protects steel from corrosive conditions by special multicoat paints and coatings. (L26n, W15; ST)

73-L. Technical Developments of 1956. Nathaniel Hall. *Metal Finishing,* v. 55, Jan. 1957, p. 42-52A.

Review of the literature on cleaning, pickling and polishing of metal surfaces, metallic coatings, electroforming, conversion films and waste treatment. 421 ref. (L general)

74-L. Automatic Plating of Zinc Die Castings. Ernest W. Horvick. *Metal Finishing,* v. 55, Jan. 1957, p. 52-55B.

Automobile and appliance uses for chromium, copper and gold plated zinc die castings. Modernization and automation of plating plants. (L17, 18-24, Zn, 5-11, *Cr, Cu, Au*)

75-L. Electroless Arsenic-Zinc Alloy. Harry J. West. *Metal Finishing,* v. 55, Jan. 1957, p. 56.

Temperature, chemical composition of electrolyte; uses of this type of plating. (L28; As, Zn)

76-L. Cleaning of Lead Anodes for Chromium Plating. L. Missel. *Metal Finishing,* v. 55, Jan. 1957, p. 56, 58.

Chemical composition of electrolyte; soaking methods. (L12, L17; *Cr*)

77-L. Chromium Plating From the Trivalent Bath. Melvin R. Zell. *Metal Finishing,* v. 55, Jan. 1957, p. 57-58.

Formamide addition to the plating solution and the operating conditions. 5 ref. (L17a; *Cr*)

78-L. Science for Electroplaters. 20. Polarization II. L. Serota. *Metal Finishing,* v. 55, Jan. 1957, p. 59-62.

Metal deposition, overvoltages of hydrogen and of metal, simultaneous deposition of two metals, polarization cells and the Haring cell. (L17, N12d)

79-L. Mechanical Finishing of Precision Parts. L. H. Hopewell. *Plating,* v. 44, Jan. 1957, p. 36-39.

Discussion of automatic barrel finishing equipment. (L10d)

80-L. Barrel Finishing With Steel Balls and Shapes. C. B. Schaefer and R. G. Messenger. *Plating,* v. 44, Jan. 1957, p. 40-42.

Equipment and application. (L10d, 1-2)

81-L. Preparation for Electroplating With Coated Abrasives. Warren K. Seward. *Plating,* v. 44, Jan. 1957, p. 43-46.

Methods of surface preparation. Discussion of contact wheels, lubricants, abrasives and operating techniques. (L10, NM-h, NM-j)

82-L. The Role of Modern Barrel Finishing. C. J. Glasrud. *Plating,* v. 44, Jan. 1957, p. 47-51.

Definition of process, equipment and applications. (L10d)

83-L. Stop Chrome Waste, Pollution and Heat Loss. E. W. Neben. *Plating,* v. 44, Jan. 1957, p. 52-55.

Plating solution recovery system. (L17, A8b)

84-L. Electrodeposited Rhodium in Co-Axial Radio-Frequency Circuits. D. O. Walter. *Platinum Metals Review,* v. 1, No. 1, Jan. 1957, p. 14-19.

Recommendations for thickness of deposit and suggestions on design of the contact elements. (L17, T1; Ag, *Rh*)

85-L. Deburring Is a Precision Process. *Steel,* v. 140, Jan. 21, 1957, p. 82-85.

Deburring by machinery permits almost machining accuracy, improves surface finish, cleans parts with great time saving over hand methods. (L10)

86-L. Aircraft Engineering Plating. C. L. Hibert. *Western Machinery and Steel World,* v. 48, Jan. 1957, p. 79-83.

Properties and applications of zinc, cadmium, chromium, tin, silver or nickel plating. Data for corrections needed in pre-plate dimensions. (L17; *Zn, Cd, Cr, Sn, Ag, Ni*)

87-L. Degreasing, Surface Treatment and Corrosion Protection. *Wire,* Dec. 1956, p. 33-36.

Machines for rinsing and degreasing, electrostatic lacquering, phosphating and blueing, galvanizing and pickling. (L general, 1-2)

88-L. (German.) **Investigations on the Pickling Process.** Werner Lueg, Winfrid Dahl and Hans-Juergen Engell. *Stahl und Eisen,* v. 76, Dec. 13, 1956, p. 1678-1685.

Materials tested and testing methods, pickling tests on hot rolled strip in sulphuric acid, on samples with scale formed during annealing in sulphuric acid and hot-rolled strip in hydrochloric acid, in a mixed acid solution, subsequent treatment by prestressing, and conclusions. 5 ref. (L12g; ST)

89-L. (German.) **The Diamond as a New Polishing Material.** Rudolf Vogel. *Zeitschrift für Metallkunde,* v. 47, Dec. 1956, p. 775-777.

Application of diamond powder. The method, useful for soft as well as hard alloys, reduces the time required for polishing and avoids difficulties arising in some cases with alumina. (L10b; NM-k 37)

90-L. Surface Finishing. *Aircraft Production,* v. 19, Jan. 1957, p. 2-7.

Barrelling method for surface finishing high-tensile steel; spar finishing machine and its operations. (L10d; ST, SGB-a)

91-L. Cyclic Electrolysis. Part I—The Influence of Periodic Reversal of Current Upon Concentration Polarization During Metal Deposition. A. Hickling and H. P. Rothbaum. *Bulletin of the Institute of Metal Finishing,* v. 6, no. 4, winter 1956-1957, p. 53-66.

In the cathodic part of the cycle the onset of limiting diffusion conditions is deferred, and the current efficiency and average rate of metal deposition are increased. Effects are greatest under conditions such that diffusion away from the electrode of anodically formed ions is minimized. 5 ref. (L17)

92-L. The Mechanism of Deposition of Titanium Coatings From Fused Salt Baths. M. E. Straumanis, S. T. Shih and A. W. Schlechten. *Electrochemical Society; Journal,* v. 104, Jan. 1957, p. 17-20. (CMA)

Titanizing consists of the collision of titanium particles, dispersed in a molten bath, with a ceramic or metallic surface, and diffusion into a substrate if the temperature is sufficient. Coats may be applied to iron, using KCL or NaCl baths and larger amounts of dispersed titanium subchlorides. Lower titanium chlorides are produced through the reduction of bath chlorides by titanium. Working temperatures vary,

but are above 900° C. 14 ref. (L15; Fe, *Ti*)

93-L. A New Method for the Determination of Sulphate in Chromium Plating Solutions. C. J. Keattch. *Electroplating and Metal Finishing,* v. 10, Jan. 1957, p. 2-6.

Efficient analytical procedure involves reduction of sulphate to sulphide followed with volumetric determination. 11 ref. (L17a, S11j; *Cr*)

94-L. Shot Blasting and Shot Peening of Light Alloys. F. Flusin. *Electroplating and Metal Finishing,* v. 10, Jan. 1957, p. 15-17.

Applications, advantages and limitations of siliceous sand, corundum sand, iron shot, vegetable particles, light alloy shot and vapor blasting. (L10c, G23n; EG-a 39, NM-j)

95-L. Whirlpool's New Dryer Finishing System. Henry Karvalski. *Finish,* v. 14, Jan. 1957, p. 38-41.

Flow-coating and draining off the primer; electrostatic spraying of enamel. (L26n)

96-L. How We Finish Instrument Control Panels. Slator S. Taylor. *Industrial Finishing,* v. 33, Jan. 1957, p. 20-24.

Methods of grinding down welds, shot blasting the surfaces, cleaning, application of surfacer and wet sanding of instrument and control panels preparatory to finishing with top-coat pigmented lacquer. (L10c, L12, G18)

97-L. That Protective Coating on the Interior of Beverage Cans. J. A. Chew. *Industrial Finishing,* v. 33, Jan. 1957, p. 32-40.

Automatic operations of blank coating, slitting, forming, soldering, spraying of lacquer and baking of beverage cans. Methods of insuring uniform heat and constant viscosity of the lacquer by the use of paint heaters and compressed air-driven, propeller-type agitators. (L26n)

98-L. Hammer Finishes. *Industrial Finishing,* v. 33, Jan. 1957, p. 43-48.

Production of smooth and durable one-coat hammer finishes. Enumerates the baking formulation, the spraying techniques and the variables influencing the size of the hammer pattern. (L26n, L10g)

99-L. Hard Coatings and Surfaces for Metals. Robert J. Fabian. *Materials & Methods,* v. 45, Jan. 1957, p. 121-140.

Survey of the major types of hard coatings and surfaces, covering metals which can be treated, hardness and thickness, wear and corrosion properties and chief advantages and limitations. 29 ref. (L general)

100-L. Corrosion Resistance; Do You Have It? *Industrial Finishing,* v. 33, Jan. 1957, p. 55-57.

Factors involved in the selection of protective coatings to prevent steel from rusting and corroding, from the view point of the nature of the surfaces to be coated, conditions of exposure and cost. (L general, R general)

101-L. Surface Treatment and Finishing of Light Metals. Part XIII-C. Plating on Aluminum—Zinc Immersion Processes. S. Wernick and R. Pinner. *Metal Finishing,* v. 55, Feb. 1957, p. 61-65.

Effect of solution composition, alloy composition, temperature, pretreatment and double zinc immersion technique. (L16; Al, *Zn*)

102-L. Science for Electroplaters. 21. Throwing Power. L. Serota. *Metal Finishing,* v. 55, Feb. 1957, p. 68-72.

Throwing power determination, current distribution and the cell design. (L17b)

103-L. Bright Nickel Plating. I. R. Bellobono. *Metal Finishing Journal,* v. 3, Jan. 1957, p. 5-9, 12.

The reaction mechanism and theory of preferred orientation of nickel crystals. (L17, M26c; *Ni*)

104-L. A Review of Processes in Current Use for the Surface Treatment of Titanium. H. Richaud. *Metal Finishing Journal,* v. 3, Jan. 1957, p. 10-12. (CMA)

Among the surface treatments of titanium which are reviewed are three pickling processes (Virgo, HF-HCl and HF-HNO_3), anodizing in a sulphuric or phosphoric medium, and electrodeposition on either an electrodeposited zinc film or on an intermediate anodic oxide film. Procedures and materials are described. (L12g, L19n, L17; Ti)

105-L. The Pretreatment of Metal Surfaces. Maxwell Lewis. *Metal Finishing Journal,* v. 3, Jan. 1957, p. 29-36.

Cleaning procedure, phosphating processes, parkerizing, bonderizing and anodizing and other treatments. (L12, L14, L19)

106-L. Alkaline Copper Plating. M. Mercadov. *Metal Industry,* v. 90, Jan. 1957, p. 27-28.

Effects of varying the chemical and physical characteristics of the bath. (L17a, L17b; Cu)

107-L. This Is Barrel-Finishing. *Precision Metal Molding,* v. 15, Feb. 1957, p. 52-57.

Describes the barrel-finishing process permitting the removal of burrs, sharp edges, tool marks, flash and heat treatment scale from small or large quantities of parts. Typical cost savings for barrel finishing as compared with hand finishing are cited. (L10d)

108-L. Porosity Detection in Plated Coatings. *Precision Metal Molding,* v. 15, Feb. 1957, p. 51, 59.

Method of detection of pores and other flaws in electroplated coatings by the photographing of an electroplated specimen exposed to radiation. Reveals pits, voids and inclusions to the order of 0.001 in. in diameter. (L17c, 9-18)

109-L. A New Pre-Paint Treatment for Aluminum. *Precision Metal Molding,* v. 15, Feb. 1957, p. 60-61, 64.

Details of a new surface treatment of aluminum castings, forgings, extrusions or any other fabricated form of aluminum base alloys prior to organic coatings. Indicates that this electrolytic process, using a chromic-phosphoric acid bath of controlled composition and pH, is inexpensive and gives complete adhesion under severe conditions. (L13n; Al)

110-L. Finishing Methods for Magnesium Alloy Pressure Die-Castings. A. C. Street. *Product Finishing,* v. 10, Jan. 1957, p. 50-58.

Applications of pressure die castings. Degreasing and cleaning methods, chromate treatments, fluoride anodizing baths, pink finishes and protection during storage and transit.
(L12, L14c, L19q; Mg, 5-11)

111-L. Aluminum Dip Coated on Steel Parts. R. F. Joy. *Steel,* v. 140, Feb. 4, 1957, p. 105-106.

Process for applying coat includes precleaning, pickling, preheating, coating and spinning. (L16; ST, *Al*)

112-L. Chemical Base Coatings for Zirconium and Zircaloy. E. J. Hennessey and A. W. Grella. *U.S. Atomic Energy Commission, BRB-28,* March 15, 1956, 26 p. (CMA)

A successful bath has been developed for coating zirconium and Zircaloy prior to deep drawing; the immersion time is 10-12 min., temperature 60°-80° C., and composition is 50 g. per 1. Na_3PO_4, 20 g. per 1. $KF.2H_2O$ and HF to pH 5.0-5.5. A prior aqueous pickle is necessary. The coat is adherent and acts as a lubricant undercoat. Data on the working life of the bath were prepared. Analytical controls are lacking. (L14b, G4; Zr, NM-h)

113-L. Chemical Surface Treatment for Titanium. H. A. Pray, P. D. Miller and R. A. Jefferys. *U.S. Watertown Arsenal Laboratory, Report 401/45-26,* May 1953, 43 p. (PB 111805). Abstracted in *U.S. Government Research Reports,* v. 27, Feb. 15, 1957, p. 57-58. (CMA)

Two immersion treatments are noted which offer practical coats for titanium. The coats when subjected to mild heat treatments will show improved resistance to galling and wear. Core properties are unchanged. (L16; Ti)

114-L. Metallizing Solves Heat and Rust Problems. *Welding Engineer,* v. 42, Jan. 1957, p. 77.

Sprayed zinc or aluminum solved corrosion and heat transfer problems in refrigerator units.
(L23; *Zn, Al*)

115-L. Aircraft Engineering Plating. C. L. Hibert. *Western Machinery and Steel World,* v. 48, Jan. 1957, p. 79-83.

Properties and application of various platings. (L17, T24, 8-12)

116-L. (French.) **Protective Coatings Against Rust and Their Selection in Practice.** *Metallurgie et la Construction Mecanique,* Dec. 1956, p. 1027-1033.

Survey of the causes and nature of corrosive action together with an analysis of factors to be considered in rendering optimum protection. Examples of various methods in specific situations.
(L general, R general)

117-L. (Italian.) **Nickel Plating by Chemical Reduction.** Celestino Stoffel. *Il Nickel.,* no. 64, Oct. 1956, p. 1-11.

Historical data; chemical and physical characteristics of deposits, particularly as obtained by Kanigen process; equipment used for single cycle and continuous cycle baths; applications; cost factors as compared with electrodeposition. 12 ref. (L28; *Ni*)

118-L. (Book.) **Finishing Handbook and Directory, 1957.** I. S. Hallows, ed. 485 p. 1957. Sawell Publications, Ltd., 4 Ludgate Circus, London E.C. 4, England.

Technical data on cleaning, painting, enameling, and electroplating; directory of manufacturers, list of trade names. (L general)

119-L. (Book.) **Industrial Finishing Year Book 1956.** 244 p. Arrow Press Ltd., 29 Grove Rd., Leighton Buzzard, Beds., England.

Compendium of information covering all aspects of industrial finishing, such as protection, cleaning, polishing, electroplating, paint data, paint finishes, metal coloring. Provides comprehensive tables listing cleaning solutions, physical characteristics of electrodeposited coats, properties of common solvents, electric potentials of metals, barrelling data, etc. Contains also a list of British standards affecting the finishing industry as well as finishing materials and equipment classified both by product and supplier. (L general, S22)

120-L. Ultrasonic Deburring. John P. Wright. *American Machinist,* v. 101, Feb. 11, 1957, p. 129-136.

Case history involving precision gears, clutch drum, precision spacers, recording needle and other applications demonstrate ultrasonics ability to remove microscopic burrs, radius edges, improve surface finish and clean part. (L10f, G24c)

121-L. Aluminum-Coat Steel Parts for All-Weather Wear. R. F. Joy. *Iron Age,* v. 179, Feb. 7, 1957, p. 106-107.

Utility pole hardware is coated by simplified process, including precleaning in fused salt, pickling, preheating in salt bath and coating. (L16, L12; ST, *Al*)

122-L. Dip Coatings, Chromium Cut Galling of Titanium. *Materials and Methods,* v. 45, Feb. 1957, p. 148-149. (CMA)

Protective coatings can be deposited on titanium which minimize its tendency to gall and oxidize. Conversion coatings are preferable to anodic and immersion coatings from an economic and operational viewpoint. The chemical baths used were fluoride-phosphate and fluoride-borate types, and are run at about 185° F. Chromium electrodeposits may be formed on a prior titanium fluoride film by use of a conventional plating bath; heat treating the plate at 1470° F. is necessary. (L14; Ti, *Cr*)

123-L. Processes and Techniques for Achieving Extreme Surface Hardness and Wear Resistance. Frank J. Rizzo. *Metal Treating,* v. 8, Jan.-Feb. 1957, p. 8-9; disc., p. 33.

Methods employed in hard chromium plating of aluminum and titanium, pretreatment, coating characteristics. (L17; Al, Ti, *Cr*)

124-L. How to Color Anodized Aluminum. B. M. Phelan. *Modern Metals,* v. 13, Feb. 1957, p. 35-39.

Coloring characteristics of Alumilite, chromic acid, oxalic acid processes; pretreatment and process steps for each; basic conditions; dyes and dyebaths; stripping faulty films; special effects. (L14, L19; Al)

125-L. Effects of Impurities in Cyanide Plating Solutions. H. L. Benner and R. R. Bair. *Plating,* v. 44, Feb. 1957, p. 151-155.

Deleterious effects, objectionable limits and corrective measures for metals and other materials frequently contaminating zinc cyanide solutions with or without brighteners, high and low-efficiency copper plating solutions, cadmium-silver plating solutions and brass plating solutions. (L17a)

126-L. Anodized Aluminum for Automobile Trim Parts. C. F. Nixon and H. A. Kahler. *Plating,* v. 44, Feb. 1957, p. 156-160.

Modern appearance, ease of fabrication and corrosion resistance have increased the use of anodized aluminum trim on G.M. cars. Sequence of operations used in the anodizing process. (L19, T21; Al)

127-L. Economics of Treatment of Strong Chromic Acid Solutions. George E. Glover. *Plating,* v. 44, Feb. 1957, p. 161-165.

Relative costs of destruction and replacement or recovery with ion exchange resins for varying degrees of metallic contamination of strong chromic acid solutions. (L17a; *Cr*)

128-L. Effects of Impurities and Purification of Electroplating Solutions. A. J. Smith and Ralph Bacon. *Plating,* v. 44, Feb. 1957, p. 186-187.

Addition of 700 ppm. calcium to Watts solution, organic bright solution and nickel-cobalt bright solution had no effect on appearance, ductility, throwing power, hardness, adhesion or corrosion resistance of electrodeposited nickel. No satisfactory methods found for eliminating calcium. (L17a; *Ni*)

129-L. Corrosion Protection From Vacuum-Bonded Clad Material. R. C. Bertossa. *American Brewer,* Feb. 1957, p. 47-48, 65.

Vacuum-brazed clad products are finding uses in corrosion-resistant service, in brewing and other industries; advantages of vacuum brazing; techniques of high-vacuum and flux-free cladding. (L22, K8, 1-23)

130-L. Chelating Agents in Metal Cleaning and De-Rusting. J. K. Aiken and C. Garnett. *Electroplating and Metal Finishing,* v. 10, Feb. 1957, p. 31-35.

E.D.T.A. (ethylene-diamine-tetra-acetic acid) group of chelating agents is characterized by its a ability to "dissolve" water-insoluble metal oxides and hydroxides, carbonates, sulphates and phosphates which are formed when metals corrode. E.D.T.A. is thus valuable in special-purpose cleaning compositions for metals and also as an additive to conventional alkaline cleaners. (L12p)

131-L. Electrodeposition From Sulphamate Solutions. Part III. Nickel-Zinc Alloys. S. Sathyanaraya and T. L. Rama Char. *India Section, Electrochemical Society, Bulletin,* v. 5, Oct. 1956, p. 83-85.

A bath containing nickel and zinc sulphamates used for the co-deposition of nickel and zinc. At cathode efficiencies close to 100%, the nickel content in the alloy deposit is very low. It is possible to increase the nickel content to high values at the sacrifice of efficiency. 8 ref. (L17a; Ni, Zn)

132-L. Chemical and Electrolytic Polishing of Surfaces—Part I. P. Grivel. *Industrial Finishing,* v. 9, Jan. 1957, p. 339-341, 345.

Seven chemical polishing solutions of American or German origin were tested on brass, nickel silver, bronze, cupro and copper strips. The degree of polish was evaluated and compared. (To be continued.) (L10f, L13p; Cu, Ni, Ag)

133-L. Why Centerless Brushing Finishes Faster. R. C. Sasena. *Iron Age,* v. 179, Feb. 21, 1957, p. 91-93.

Power brushing without centering chucks speeds work which varies from deburring to satin finishing; for tasks ranging from cleaning bar stock to polishing pistons. (L10e)

134-L. Silicone Coatings for Metal Products. L. F. Stebleton. *Materials and Methods,* v. 45, Feb. 1957, p. 112-115.

General discussion of silicone coatings and their uses where resistance to heat, moisture and corrosive conditions are advantageous. (L26p; NM-33)

135-L. Burnishings for Profit. Ted Brolund. *Metal Removing,* v. 1, Feb. 15, 1957, p. 23-25.

Method of surface finishing where hardened steel or carbide is slid or rolled over a surface made of a softer ductile material under extreme pressure. Advantages over grinding. (L10g)

136-L. Developments in Protective Processes: the Phoscadising Process. *Product Finishing,* v. 10, Jan. 1957, p. 64-67.

Details of three-stage operation involving electrical deposition of phosphate alloy, phosphate coat, alloy coat and sealing coat. (L14b)

137-L. Titanium Coating and Its Application. I. Titanium Cementation. T. Yamaguchi, K. Hirayama and T. Takei. *Tokyo Scientific Research Institute, Journal,* v. 50, Dec. 1956, p. 247-252. (CMA)

Iron and steel acquire a titanium coating when contacted with the powder at 950 to 1200° C. under reducing conditions. The activation energy of the diffusion process is estimated to be 58-62 k-cal. The structure of the highly corrosion resistant coat includes an outer titanium layer (β solid solution) and an inner $TiFe_2$ columnar layer. Influences of time and temperature were studied analytically; 0.3% carbon in the steel decreases the thickness of the layer by 2/3 and makes for nonuniformity. (L15; ST, *Ti*)

138-L. (English.) **Stainless Plated Plates.** *Aciers Fins et Speciaux Francais,* no. 24, Dec. 1956, p. 73-75.

French methods of manufacturing stainless steel clad plates; manufacture, rolling and treatment; grades of steels most commonly used; advantages derived from the use of the plate (including an improvement in thermal conductivity and mechanical strength). (L22, F23; SS, 4-3)

139-L. (French.) **Trend to Plastic Coatings in Corrosion Prevention.** L. Remy. *Corrosion et Anticorrosion,* v. 4, June 1956, p. 217-221.

Nature and applications of plastic coatings; analyzes protection afforded. (L26p)

140-L. (French.) **Surface Treatment of Titanium.** H. Richaud. *Corrosion et Anticorrosion,* v. 4, Dec. 1956, p. 400-402. (CMA)

A brief description of the processes of anodic oxidation of the sur-

face layer of titanium, and of electroplating of titanium with coatings of copper, nickel, chromium, etc. Such coatings are deposited on an intermediary layer of oxide or on a coating of zinc. Mention is made of the brazing procedure in which titanium parts are joined by means of electrolytic coatings of 60% Ag, 32% Cu and 8% Zn (deposited simultaneously or, preferably, successively); parts so coated and assembled are brazed in a furnace for 30 min. at 800° C. 1 ref.
(L19, L17, K8k; Ti)

141-L. (French.) **Zinc Plate on Steel Cartridge Cases.** *Galvano,* no. 240, Jan. 1957, p. 19-24.

Zinc plating processes, equipment and methods at the Norris-Thermador Corp., Los Angeles.
(L17; ST, *Zn*)

142-L. (French.) **Influence of Chromizing on the Oxidation Resistance of Steels and of Nickel and Cobalt Alloys.** R. L. Samuel and T. P. Hoar. *Galvano,* no. 240, Jan. 1957, p. 33.

Notes that the diffusion of chomium, or chromatizing, produces better resistance to oxidation at high temperatures for a large number of metals and alloys such as iron, nickel and cobalt.
(L15, R1h, 2-12; Ni, Co, *Cr*)

143-L. (French.) **Surface Treatment Prior to Galvanizing: Degreasing.** A. Herz. *Métallurgie et la Construction Mécanique,* v. 89, Jan. 1957, p. 49-51.

Proper preparation of the surface. Degreasing methods must be selected according to the nature of the metal and fatty substances; description of degreasing by use of an alkaline solution, surface tensions, wetting agents, influence of the pH. Discusses regeneration of baths and gives practical advice on the conduct of the operation. (L12k, L16, ST, *Zn*)

144-L. (French.) **Aluminum Coating of Iron and of Ferrous Metals.** Louis Grand. *Revue de l'Aluminium,* no. 239, Jan. 1957, p. 63-73.

The protection of iron by a thin aluminum coating extends to a cheap metal the high resistance to corrosion, good behavior under high temperatures and fine aspect of the light metal. This coating process necessitates a complete elimination of oxide films between the two metals, reducing to a minimum the fragile intermetallic zone. The deposition of aluminum, after sand blasting or pickling, must be carried out under a neutral or reducing atmosphere, in a volatile liquid or in the presence of a flux enabling the aluminum to thoroughly "wet" the iron. Bath temperature and immersion time must be reduced so as to obtain a flexible deposit. 3 ref.
(L15; Fe, *Al*)

145-L. (French.) **Surface Treatment of Aluminum and Its Alloys. Electrolytic Treatment—Anodic Oxidation. The Sulphuric Process.** Charles Etienne and Francois Flusin. *Revue de l'Aluminium,* no. 239, Jan. 1957, p. 89-99.

Discusses the adjustment of the operation conditions so that the oxidation speed notably exceeds the dissolution speed and the anodic film does not feature a granular texture. Practical data are given on the conditions of oxidation for pure aluminum and for the main alloys. Reviews influence of the concentration of the electrolyte, temperature, current density and time of oxidation. (L19n; Al)

146-L. (French.) **Treatment of Surfaces Before Cold Working by the Process of Phosphating.** M. Lefevre. *Revue Générale de Mécanique,* no. 95 (new series), Dec. 1956, p. 403-406.

Phosphating as a chemical process, advantages gained by the use of phosphate coatings in the drawing of steel. (L14b, G4; ST, NM-h)

147-L. (German.) **Galvanizing Screws and Other Small Parts. I.** Werner Peters. *Draht,* v. 8, Jan. 1957, p. 7-13.

Qualitative requirements and preparation of screws, springs, wire-bending devices, etc., for the galvanizing process. (L16, T7; *Zn*)

148-L. Exterior Aluminum Cleaning. *Cleaning and Maintenance,* v. 5, Feb. 1957, p. 4-41.

Unanodized aluminum and anodized aluminum evaluated in relation to corrosion and cleaning in rural, industrial and marine atmospheres. (L12, R3; Al)

149-L. Kinetics of Metal Deposition: Polarography Using Stationary Microelectrodes. *Electrochemical Society, Journal,* v. 104, Feb. 1957, p. 116-123.

Current-voltage curves arising from metal deposition were determined using a variety of stationary micro-electrodes, mostly vertical wires, and the concentration polarization approximated that expected from convective diffusion. An equation is formulated that can be used to calculate limiting current densities during alloy formation. 22 ref.
(L17, 1-4)

150-L. Nitriding Curbs Rust on Cans. J. R. Marshall. *Food Engineering,* v. 29, Feb. 1957, p. 99-102.

Remedy for rust indicated in the sodium nitrite treatment; testing techniques. (L15, T28)

151-L. A Note on Salts in Galvanizing. A. Gordet. *Galvano,* no. 240, Jan. 1957, p. 38-40.

Discusses the role of fluxes—ammonium zinc chloride, sodium chloride and ammonium chloride—in hot dip galvanizing, and stresses that the thickness of the coating applied depends on the duration of immersion, speed of withdrawal from the bath and the temperature.
(L16; *Zn,* RM-q)

152-L. The Chemical and Electrolytic Polishing of Surfaces—Part II. P. Grivel. *Industrial Finishing,* v. 9, Feb. 1957, p. 400-401.

Electrochemical method based on the anodic dissolution of the element to be polished. Two systems are used, one has a resistance in series and the other has two resistances in parallel. Table of bath compositions for nonferrous metals is included. (L13p)

153-L. Metal Cleaning and Finishing by the Airless Abrasive Blasting Process. F. W. Pedrotty. *Institute of Production Engineers, Journal,* v. 36, Feb. 1957, p. 128-135.

Cleaning castings, removing scale from forgings, removing heat treating scale, cleaning weldments and preparing surfaces for final finishing by airless abrasive process. Types and sizes of ferrous abrasives described. (L10c, 9-2)

154-L. A Method of Determining the Sag Resistance of Porcelain Enameling Steels. H. D. Gonaway. *Metal Products Manufacturing,* v. 14, Mar. 1957, p. 32-33.

Investigation of five methods for supporting specimens and the equipment and methods for conducting steel sag tests. (L27, 1-14; ST)

155-L. The Role of Oxygen in Iron-Enamel Adherence. *Metal Products Manufacturing,* v. 14, Mar. 1957, p. 35-36, 87.

Evidence indicates interface roughness does not completely account for porcelain enamel adherence; work is needed to isolate other mechanisms in vitreous coating adherence. Controlled atmosphere tests are discussed. (L27, Q10c)

156-L. Vitreous Enamelling Aluminum Tiles. *Product Finishing,* v. 10, Feb. 1957, p. 86-90.

3S aluminum alloy strip is drawn through a six-stage cleaning and Alodizing process, thereby eliminating prefiring. After stamping, the tiles are spray coated, then baked in an electrically heated convection-type furnace. (L27; Al)

157-L. Protective Coatings for Titanium. *Products Finishing,* v. 21, March 1957, p. 44-46. (CMA)

A method of electrodepositing protective coats on titanium involves a pretreatment consisting of degreasing and cleaning the surface, suspension in a solution of hydrogen fluoride and acetic acids for 10-15 min., and passing 60-cycle ac. through the specimen for 10 min. The rinsed specimens may then be transferred to a chromium plating bath. The formation of an oxide film is thus prevented.
(L12, L13, L17; Ti, *Cr*)

158-L. Metal Drums Coated Centrifugally. *Steel,* v. 140, March 4, 1957, p. 94.

Steel drums are held stationary while spinning rotor travels through them and sprays on atomized coating. Variety of materials including phenolics and vinyls may be applied with high thickness accuracy by centrifugal spraying. (L26; ST)

159-L. Strand Bonderizing. *Wire Industry,* v. 24, Feb. 1957, p. 169, 173.

A new coating process developed by the Pyrene Co. Ltd., Middlesex, England, in which it is possible to handle 24 strands of wire with speeds up to 60 ft. per min.
(L14b; ST, 4-11)

160-L. (French.) **Trend to Plastic Coatings in Corrosion Prevention.** L. Remy. *Corrosion et Anticorrosion,* v. 4, June 1956, p. 217-221.

Analysis of the corrosive mechanism; nature and applications of protective coatings such as polyvinyl and polyethylene; methods of coating; anticorrosive protection afforded. (L26p)

161-L. (French.) **Improvement in Resistance to Corrosion by Metallic Coatings Other Than Those Produced by Electroplating.** *Pratique des Industries Mecaniques,* Dec. 1956, p. 335.

Describes the metallizing or metal-spraying process using an oxy-acetylene or oxypropane gun; indicates conditions required for optimum results. (L23, 1-2)

162-L. Electrodeposition of Titanium. Part 3. E. W. Reid, Jr., J. H. Connor and A. Brenner. U.S. Na-

tional Bureau of Standards (Wright Air Development Center). *U.S. Office of Technical Services,* PB 121721, Sept. 1956, 18 p., $.50.

Study of baths of an ether and a soluble reactive titanium compound in an effort to increase titanium content of the alloys over the 6.5% previously obtained. The possibility of using sodium or potassium borohydride instead of lithium borohydride to prepare titanium and zirconium borohydrides was examined. (L17a; Ti)

163-L. Characteristics of Refractory Oxide Coating Produced by Flame-Spraying. N. N. Ault. *American Ceramic Society Journal,* v. 40, Mar. 1, 1957, p. 69-74. (CMA)

Application of refractory oxides by flame-spraying rods of these materials. Zirconia, stabilized with calcium oxide, is coated on a base with only the cubic form present. The bulk density can be varied more easily than with alumina coatings. In a thermal expansion test the coat reverted to a mixture of the cubic and monoclinic forms. Zircon dissociates when flame sprayed, and X-ray diffraction of the coat reveals only cubic ZrO_2. The coating has a glassy nature and inverts to the monoclinic form on thermal treatment. (L27, 1-2; *Zr*)

164-L. Flame Spraying Spins Protective Coating for Missiles. *Jet Propulsion,* v. 27, Mar. 1957, p. 306-311.

Flame spraying; processes and properties of coatings. 11 ref. (L27; T2)

165-L. Diffusion Coating With Silicon. N. S. Gorbunov and A. S. Akopdzhanyan. *Journal of Applied Chemistry of the USSR,* v. 29, May 1956, p. 713-716. (Translated by Consultants Bureau, Inc., 227 W. 17th St., New York 11, N.Y.).

An advantage of the proposed method for diffusion coating is filling of the reaction space of furnace with chlorine at room temperature. The thickness of the silicon layer depends on the temperature and duration of treatment and on the carbon content in the base metal. 12 ref. (L15; *Si*)

166-L. Investigation of the Causes of Foaming of Pickling Solutions. V. A. Kuznetsov and I. G. Chufarova. *Journal of Applied Chemistry of the USSR,* v. 29, May 1956, p. 749-752. (Translated by Consultants Bureau, 227 W. 17th St., New York 11, N.Y.).

Stability of foam formed by industrial pickling baths and by artificial solutions. The experimental results show that the foam formed in pickling solution is stabilized by colloidally dispersed silicon dioxide (SiO_2) which accumulates in the solutions during their use. (L12g)

167-L. The Norton Roxide Coating Process for High-Temperature Operation. *Machinery (London),* v. 90, Mar. 8, 1957, p. 525-527. (CMA)

Protective coats of refractory oxides are applied by spraying onto the cold metal base. Zirconia, melting at 4500° F., may be applied to low-melting metals like aluminum and magnesium without harming them. The coating materials are alumina, zirconia or a zirconia-silica mixture and are used in rod form. An oxy-acetylene flame spray gun is used. Applications are described and shown. (L27, 1-2; Al, Mg, *Zr*)

168-L. Electrolytic Polishing. J. Bergere and R. Mondon. *Metal Industry,* v. 90, Feb. 1957, p. 127-129.

Effects of surface finish obtained by electrolytic or mechanical polishing on fatigue strength and corrosion resistance. Types of tanks and other equipment, solutions for different groups of alloys, chief applications of electropolishing. (L13p, Q7a, R general)

169-L. Protection of Steel Surfaces. The Chromizing Process of Metal-Gas Co. Ltd. *Metal Treatment and Drop Forging,* v. 24, Feb. 1957, p. 65-68.

Advantages and applications of patented British chromizing process in which high reactive chromous chloride is brought in contact with steel surface at temperatures of the order of 1000° C. (L15; ST, *Cr*)

170-L. Painting of Galvanized Steel. H. W. Chatfield. *Paint, Oil and Colour Journal,* v. 131, Feb. 22, 1957, p. 430-434.

Calcium plumbate with waterground mica added shows advantages over red lead. Baked primers improve adhesion. Results of natural weathering tests are given. (L26n, R3; ST, 8-15, NM-g30)

171-L. Brushes Solve Finishing Problems. R. C. Sasena. *Steel,* v. 140, Mar. 18, 1957, p. 144-146.

Power brushes are used to deburr and finish automatic transmission parts including steel gears and

shafts, clutch housings, etc.
(L10e; ST)

172-L. Siliconizing of Metals in Liquid NaK. E. S. Fisher, R. A. Noland and C. Marzano. Paper from "Metallurgical Information Meeting, Ames Laboratory", May 1956, *U.S. Atomic Energy Commission,* TID-7526 (Pt. 1), Feb. 1957, p. 268-281.

Surface diffusion layers consisting of base metal silicides have been produced on uranium, molybdenum and some steels by immersing the metal in liquid sodium-potassium alloy containing dissolved silicon. This method of siliconizing is advantageous in that the coatings can be produced at relatively low temperature, and oxidation of the surface prior to the formation of the silicides can be minimized in the sodium-potassium medium. Consequently, it may be a favorable means for producing corrosion resistant surfaces on some reactive metals.
(L15; U, Mo, ST, *Si*)

173-L. (French.) **Stains on Electrolytic Deposits: Origin and Remedies.** J. Liger. *Galvano,* no. 241, Feb. 1957, p. 37-39.

Investigation into the origin of small white stains appearing on recently prepared electrolytic deposits. Causes of this phenomenon; suggests that porosity of the metal is the principal factor. Appropriate remedies. (L17c, 9-21)

174-L. (French.) **Industrial Methods of Chemical Brightening of Aluminum.** A. W. Brace. *Galvano,* no. 241, Feb. 1957, p. 40-50.

Two principal types of finishing by means of chemical baths, one with a phosphoric acid bath and the other containing nitric acid and ammonium difluoride; equipment employed; anodizing techniques.
(L14, 1-2, L19; Al)

175-L. (French.) **Pickling Before Galvanizing.** A. Herz. *Métallurgie et la Construction Mécanique,* v. 89, Feb. 1957, p. 125-127.

Form in which oxides appear, conditions under which they are formed and means of attacking them. Studies comparative advantages and drawbacks of sulphuric acid and hydrochloric acid. The main drawback of the former lies in the difficulty of getting rid of the sulphates produced. Inhibitors slow down the attack by acids but their choice is difficult. (L12g, L16; *Zn*)

176-L. (French.) **Chemical Oxidation of Light Metals by Alodine 100.** Jean-Jacques Meynis de Paulin. *Revue de l'Aluminium,* no. 240, Feb. 1957, p. 187-195.

The Alodine 100 chemical oxidation bath, composed mainly of phosphoric acid, chromic acid and fluorine, provides a blue-green film of amorphous double phosphate of chromium and aluminum. Reviews the grading and operation of the bath; the properties of the light metal surfaces thus treated; adhesion of the film of Alodine 100; behavior of the main classes of paint. (L14a; Al)

177-L. (German.) **Defective Spots in Anodically Oxidized and Dyed Sheet and Means for Their Avoidance.** F. E. Farrell. *Aluminium,* v. 33, Feb. 1957, p. 91-94.

Conditions under which circular bright and dark spots appeared in $AlMg_3$ sheet studied and methods to prevent them described.
(L19; Al, 9-21, 4-3)

178-L. (German.) **Porcelain Enameled Aluminium.** E. A. Ferrel. *Aluminium,* v. 33, Feb. 1957, p. 107-114.

Physical and chemical properties of enameled aluminum, comparison to steel, manufacture and storage, applications in the field of shipbuilding and architecture.
(L27, T22, T26; Al)

179-L. (German.) **New Structural Components Through Roll-Cladding.** H. Nielsen and H. Supplus. *Aluminium,* v. 33, Feb. 1957, p. 115-119.

Describes the American "Roll-Bond" or "Tube-in-Strip" process for heat exchanger elements and tube in strip form, and the German "Evidal System" for manufacture of evaporator components for refrigerators. (L22; 4-10)

180-L. (German.) **Sprayed Molybdenum Coatings.** R. Machenschalk. *Planseeberichte fuer Pulvermetallurgie,* v. 4, Dec. 1956, p. 80-84. (CMA)

Advantages of sprayed molybdenum coatings are their very high melting point (2620° C.) and their hardness (350-620 kg. per sq. mm. Vickers hardness); they are, therefore, recommended as excellent coverings for machine parts, such as crankshafts, rollers, etc. However, these coatings are porous and their chemical resistance is low; this prevents their use in anticorrosion protection of surfaces. 8 ref. (L23, *Mo*)

181-L. (Italian.) **Theory of Spray Metallizing.** Gian Giacomo Coccia. *Ingegneria Meccanica,* v. 5, June 1956, p. 23-28.

Theory of process, plus considerations on formation and physical properties of coating applied. (L23)

182-L. (Swedish.) **"Mollerization"—a New Method for Aluminum Coating Steel.** H. E. Linden. *Industritidningen Norden,* v. 84, no. 22, Oct. 31, 1956, p. 300-301, 308.

New method employing low voltage, direct current salt bath containing barium chloride, sodium chloride and cryolite. The salt cover protects the aluminum from oxidation. (L29; ST, *Al*)

183-L. (Swedish.) **Hydrogen Embrittlement in Steel in the Process of Electroplating.** Uno Trägardh. *Teknisk Tidskrift,* v. 86, Dec. 4, 1956, p. 1051-1057.

Cathodic removal of grease; pickling; and electrolytic precipitation of zinc, cadmium, copper, tin and silver. Special notice given to the influence of hydrogen absorption on the steel. (L17, L12, Q26s; ST, *H*)

184-L. **Chemical Brightening of Aluminium.** A. W. Brace. *Metal Industry,* v. 90, Feb. 23, 1957, p. 147-151 and 153.

Basic principles, composition and operations of brightening baths, equipment, anodizing techniques, testing method for film thickness, brightness, corrosion and abrasion resistance. 17 ref. (L19; Al)

185-L. **Degreasing (Pt. 1).** J. E. Entwistle. *Metal Industry,* v. 90, Mar. 8, 1957, p. 189-191.

Enumeration of factors involved in selecting a cleaning process for any particular application and review of various materials which are commercially available, including alkaline cleaners, hydrocarbon solvents. (To be continued.) (L12)

186-L. **Degreasing. (Pt. 2).** J. E. Entwistle. *Metal Industry,* v. 90, Mar. 15, 1957, p. 212-214.

Enumeration and discussion of cleaning agents and methods including chlorinated hydrocarbons, acid cleaners and fused salt baths. (To be continued.) (L12)

187-L. **Recent Developments in Aluminium Electrodeposition.** R. J. Heritage and J. R. Balmer. *Product Finishing,* v. 10, Mar. 1957, p. 54-58.

Considers and compares Grignard electrolyte, fused quaternary ammonium salts, lithium hydride solutions and aluminum alkyl electrolyte for electroforming and for possible plating on copper, iron or steel. 16 ref. (L17a, L18; Cu, ST, Fe, *Al*)

188-L. **An Iridium Plating Solution.** P. J. Ovenden. *Product Finishing,* v. 10, Mar. 1957, p. 62.

Solution for electrodeposition of iridium on copper coated steel wire. (L17a; *Ir,* 4-11)

189-L. **Testing and Examination of Electrodeposits. 1. Measurement of Local Thickness.** R. Quarendon. *Product Finishing,* v. 10, Mar. 1957, p. 65-74, 130.

Methods for measuring local thickness including jet dropping and spot tests, microscopic examination, coulometric anodic solution and magnetic method; illustrates instruments used in testing. 22 ref. (L17c, 1-3)

190-L. **Production of Bonderized Electro-Zinc Coated Steel Sheet.** *Sheet Metal Industries,* v. 34, Mar. 1957, p. 165-172.

Description of plant and processing line. (L15, 1-2; ST, *Zn*)

191-L. (French.) **Chemical Nickel Plating by the Kanigen Process.** Grégoire Gutzeit. *Revue de l'Aluminium,* no. 235, Sept. 1956, p. 805-809.

Basic idea of this process is the oxide reduction of a nickel salt by sodium hypophosphite. With this catalytic reaction a secondary combination of a fraction of the nickel with phosphorus takes place. The alloys so formed can be submitted to heat treatments which change their structure. Provides very hard and protective coatings on aluminum pieces. (L28; Al, *Ni*)

192-L. (French.) **Deterioration of Aluminum Alloy Surfaces Treated by Bright Anodic Oxidation and Submitted to Heating.** Pierre Lelong and Jean Herenguel. *Revue de l'Aluminium,* no. 236, Oct. 1956, p. 923-930.

High-purity aluminum (99.99%) and in particular the high-purity alloy Brillalmag 1 containing 1% magnesium (A9-G1) are used, after bright anodic oxidation, to produce various types of reflectors. Following heating by focused infrared radiation attention has been drawn to cracks forming in the oxide film and peeling resulting from the action of heat. Suggests methods of avoiding these defects. 4 ref. (L19; Al, 9-21, 9-22)

193-L. (Spanish.) **Experiments in Hot Dip Aluminizing of Steel.** Justo Ferrer Flotats. From "Papers Presented at 28th International Congress of Industrial Chemistry", 1956, 5 p.

Molten bath immersion method used on cylindrical test pieces (104 x 70 mm.) of 99.5% pure commercial aluminum and 12% Si aluminum alloy. Silicon reduced thickness and hardness of aluminized coatings, while increasing adhesion. 11 ref. (L16; ST, *Al*)

194-L. (Book.) **Symposium on Properties, Tests, and Performance of Electrodeposited Metallic Coatings.** *American Society for Testing Materials.* Special Technical Publication, SPT 197, 1957, 129 p.

Corrosion behavior and protective value of copper-nickel-chromium and nickel-chromium coatings on steel; evaluation of methods available for measurement of surface luster of electroplated coatings; recommended practices for cleaning prior to electroplating; a comparison of the corrosion behavior and protective value of electrodeposited zinc and cadmium coatings on steel; evaluation of phosphate coatings over electrodeposited zinc.
(L17; ST, *Zn, Cd,* 8-12)

195-L. Fifty Years of Mechanical Wire Descaling. P. Ewald. *Draht* (English Edition), no. 27, Feb. 1957, p. 29-33.

Fifty-year development of descaling machines and lubricants; descriptions of current European equipment. (L10g, 1-2)

196-L. Electroless Nickel Plating for Making Ohmic Contacts to Silicon. Miles V. Sullivan and John H. Eigler. *Electrochemical Society Journal,* v. 104, April 1957, p. 226-230.

A technique whereby an adherent plate of nickel may be deposited on silicon for use as an electrical contact. The contact may be used on either n or p-type silicon. 11 ref. (L28; Si, *Ni,* SGA-r)

197-L. Anodic Formation of Oxide Films on Silicon. P. F. Schmidt and W. Michel. *Electrochemical Society Journal,* v. 104, Apr. 1957, p. 230-236.

Dense oxide films have been formed anodically on p and n-type single crystal silicon in connection with the electrical properties of silicon surfaces. Concentrated nitric acid or phosphoric acid permits forming, but the highest voltage obtainable is less than 200 volts. A solution of potassium nitric acid in N-methylacetamide permits forming to 560 volts and is also preferable in other respects. 26 ref.
(L19, P15; Si, 14-11)

198-L. Hot-Dip Galvanizing Cast Iron. *Foundry Trade Journal,* v. 102, Feb. 21, 1957, p. 249.

Surface preparation, fluxing, zinc bath and galvanizing. (L16; CI, *Zn*)

199-L. Automatic Setup Sprays Enamel-on-Aluminum Tile. Charles J. Jensen. *Industrial Finishing,* v. 33, Mar. 1957, p. 24-28.

Processing line for spraying porcelain enamel on both sides of aluminum tile. (L27, 18-24; Al)

200-L. Using Burn-Off Ovens to Dry-Clean Metal Surfaces. P. C. Bardin. *Industrial Finishing,* v. 33, Mar. 1957, p. 40-48.

Thermal degreasing economical for many light ferrous and a few nonferrous fabrications; convection or infrared ovens successfully remove light grease on parts not subject to distortion and give parts protective oxide coatings. (L12p, W4)

201-L. Chrome-Alloying. *Machinery Market,* no. 2938, Mar. 8, 1957, p. 27-32.

Chrome-alloying is a finishing process in which the surface of the other metals is penetrated by the chromium to form an alloy. Brief summary of the application of the process, its uses and advantages.
(L15; *Cr*)

202-L. Phosphate Coatings. S. Spring. *Organic Finishing,* v. 18, Mar. 1957, p. 4-8.

Types of phosphate coatings for improving paint adhesion and reducing corrosion of metal surfaces; methods of application, bath composition and analysis and control of coating characteristics. (L14b)

203-L. Oil Removal With Heat. John E. Hyler. *Organic Finishing,* v. 18, Mar. 1957, p. 19-21.

Degreasing cold rolled sheet, wire coat hangers and other metal fabrications by vaporization of oil in burn-off oven of convection or infrared radiant types. (L10g, W4)

204-L. Metal Pretreatment and Its Effect on the Performance of Metallic Lead Primers. C. D. Coppard. *Paint Technology,* v. 21, Mar. 1957, p. 89-90.

Tests for evaluating pretreatments; service conditions; proven

paints and lead primers were used. Results described. (L26n)

205-L. A Completely Automatic Finishing Department. *Precision Metal Molding,* v. 15, Mar. 1957, p. 74-75.

Precision Castings Co. has installed a new and very extensive finishing line capable of cleaning, buffing, polishing, chemical coating, painting and baking.
(L general, 18-24)

206-L. Finishing of Small Gears by Electrolytic Polishing. Electrolytic Finishing of Gears and Changes in Their Shapes. Masao Naruse and Akira Nannicki. *Tohoku University, Technology Reports,* v. 21, no. 1, 1956, p. 107-116.

Electrolytic polishing as a means of precision finishing the teeth of small gears that have been cut by machine. (L13p, T7a)

207-L. (French.) **New Method for the Rapid Electrolytic Polishing of Surfaces and Its Metallographic Applications.** Pierre A. Jacquet. *Comptes Rendus,* v. 243, Dec. 17, 1956, p. 2068-2071.

A very simple apparatus comprising a cathode surrounded by spongy, insulating fabric permits either local or complete polishing of samples of metals and common alloys. The provision of a high degree of polish justifies the general use of this technique, originally intended for nondestructive metallographic examination. 4 ref. (L13p, M20p)

208-L. (French.) **Tendency to Automation for Protective Coatings by Chemical and Electrical Methods.** P. Orlowski. *Pratique des Industries Mécaniques,* v. 40, Jan. 1957, p. 14-15.

Survey of various types of automatic installations for chemical and electrolytic treatments allowing the constant regulation of temperature, regular filtration of the baths and precise control of the immersion time. (L general, 18-24)

209-L. (French.) **Improvement of Corrosion Resistance by Chemical Processes.** J. Meynis de Paulin. *Pratiques des Industries Mécaniques,* v. 40, Jan. 1957, p. 16-18.

Advantages of chemical deposition; methods of degreasing; phosphating of ferrous metals; uses of phosphate coatings; chemical and anodic oxidation of light metals; galvanic protection of magnesium; chemical deposition of nickel. (L general)

210-L. (French.) **Practical Methods for the Finishing of Stainless Steel Pieces.** *Revue Générale de Mécanique,* v. 41, Jan. 1957, p. 37-39.

Mill finishes; mechanical and chemical treatments; current methods of cleaning, scouring, polishing and electrolytic surface treatments. (L general; SS)

211-L. (German.) **Galvanizing of Bolts and Nuts and Small Parts. Pt. 2.** W. Peters. *Draht,* v. 8, Feb. 1957, p. 40-48.

Modern machines for galvanizing of small parts; high-performance electrolytes; nickel plating; nickel plating without current; brass, zinc, cadmium and chromium plating; after-treatment; inactivation of bolts. (L16, L17, 1-2, T7; *Zn*)

212-L. (German.) **Thixotropic Coating on Metals.** Shigeto Yamaguchi. *Kolloid Zeitschrift,* v. 149, Dec. 1956, p. 125-126.

If a thixotropic sol-gel protective layer is subjected to long periods of inactivity, irreversible alterations cause deterioration. 2 ref. (L27)

213-L. (German.) **Mechanical Descaling, Particularly Descaling by Bending, in the Processing of Steel Wire.** Clemens Eisenhuth. *Stahl und Eisen,* v. 77, Mar. 21, 1957, p. 323-334.

Present status of descaling by bending; joint tests: execution and results of the tests; single tests; characteristics of the scale and lubricants; design of the drawing tools; cleaning effect of the descaling machines used. (L10g; ST, 4-11)

214-L. (German.) **Behavior of Copper in Steel During Scaling and Its Effect on the Hot-Dip Zinc Coating of Steel Wires.** Clemens Eisenhuth, Wolfgang Gruhl, Werner Papsdorf and Irmgard Eisenhuth. *Stahl und Eisen,* v. 77, Mar. 21, 1957, p. 354-359.

Investigation of the copper distribution in steel specimens containing 0.70% C and 0.38% Cu in relation to the degree of scaling; behavior of copper when annealing in an argon atmosphere; effect of molten zinc on the copper content in the marginal zone.
(L16, J23; ST, *Zn, Cu,* 4-11, 92)

215-L. (Portuguese.) **Electrolytic Tin-Plating in the Volta Redonda Mill.** Pedro Silva. *A B M, Bulletin of the Brazilian Metals Society,* v. 45, Oct. 1956, p. 331-354.

Equipment, process details, tests. 5 ref. (L17, 1-2; *Sn*)

216-L. Nickel Plating by Chemical Reduction. *Design Engineering,* v. 3, Apr. 1957, p. 59-61.

The Kanigen nickel plating process for applying a nickel-phosphorus coating to metals without electricity. (L28; *Ni*)

217-L. Limitations of Plated Nickel in Jet Engine Design. R. W. Moeller and W. A. Snell. *Electroplating and Metal Finishing,* v. 10, Mar. 1957, p. 74-77.

Properties of nickel plated on steel from watt type, sulphamate and chemical nickel solutions include information on residual stress versus temperature; residual stress versus fatigue life and plate thickness versus corrosion resistance.
(L17C, Q25h; *Ni*)

218-L. Properties of Sprayed Zinc Coating. E. Gebhardt and H. D. Seghezzi. *Electroplating and Metal Finishing,* v. 10, Mar. 1957, p. 81-85.

Experimental values for tensile strength, hardness, impact resistance and electrical conductivity. Effect of spraying method and coating thickness on properties.
(L23, Q general, P15g; *Zn*)

219-L. The Extending Field for Vapour Blasting. *Machinery,* v. 90, Mar. 8, 1957, p. 508-515.

Covers principles of vapor blasting, standard and specialized equipment and detachments. (L10c, 1-3)

220-L. Vinyl Coatings for Metal Products. R. A. Calsibet. *Materials and Methods,* v. 45, Mar. 1957, p. 130-134.

Properties, methods of application and uses of vinyl coatings of work primer, solution and dispersion types. (L26p)

221-L. Fundamentals of Barrel Finishing. Pt. 1. Equipment and Methods. T. W. Black. *Tool Engineer,* v. 38, Apr. 1957, p. 109-118.

General report on principles, types of barrels, media, compound and other variables influencing finishes obtained. (To be continued.) (L10d)

222-L. Automatic Zinc Spraying of Steel Drums. G. A. Curson. *Welding and Metal Fabrication,* v. 25, Mar. 1957, p. 78-81.

Equipment for automatic spraying of zinc powder; sequence of operations and advantages.
(L23, 1-3; ST, *Zn*)

223-L. How to Finish Stainless Steel. Richard E. Paret. *Western Machinery and Steel World,* v. 48, Mar. 1957, p. 102-109.

Selection and protection of mill finishes; procedures and precautions in carrying out grinding, polishing, buffing, barrel finishing, embossing, mechanical and chemical etching, electropolishing, pickling, plating and enameling operations on stainless steel sheets and parts.
(L general; SS)

224-L. (German.) **Chromium-Iron-Nickel Alloys Resistant to Abrasion at High Temperatures.** G. Faber. *Schweizer Archiv,* v. 23, Jan. 1957, p. 14-19.

Sigma phase of iron-chromium alloys as a hardening agent. Two types of surface films are used, a coating produced by a blow torch using the alloy in question as filler metal and a chromium-enriched surface obtained by diffusion in an appropriate steel. 6 ref.
(L16; Cr, Ni, Fe, SGA-m, 2-12)

225-L. (Italian.) **Zinc Powder Base Protective Paints.** *Machine,* v. 12, Feb. 1957, p. 94-97.

Problems of corrosion of iron; use of zinc-base paints in place of galvanizing, metallizing, etc.; properties of such paints. (L26n; *Zn*)

226-L. (Italian.) Phosphatization of Ferrous Metals. Bonanno Bonanni. *Macchine,* v. 12, Feb. 1957, p. 161-169.

Purpose of phosphate, coatings, process cycle, types of equipment, costs. (L14b)

227-L. (Japanese.) **The Electrochemical Properties of Titanium—Pt. 3. Electrodeposition of Titanium and Its Use.** S. Morioka, T. Shibata and A. Umezono. *Japan Institute of Metals, Journal,* v. 21, Jan. 1957, p. 32-35. (CMA)

An electrolytic titanium powder is deposited from $(NH_4)_2TiF_6$-water solutions. It is black, fine, active and readily covered with an oxide film at 25° C. This film is thin, stable at high temperatures and nonconductive, thus lending itself to use as an insulating material in magnetic cores. (L17, T1; Ti)

228-L. Sprayed Metal as a Base for Paints. H. S. Ingham. *Corrosion,* v. 13, Apr. 1957, p. 44-48.

Uses of thin metallized coating of zinc or aluminum on steel. Selection, application and performance of paints applied to sprayed metal surfaces. (L23, L26n; ST, *Zn, Al*)

229-L. Electroplating for the Electronics Industry. D. J. Fishlock. *Electrical Journal,* v. 158, Mar. 15, 1957, p. 750-755.

Mechanisms of plating including Dalic plating; description of modern electroplating equipment. Mechanical properties of deposited nickel, chromium, rhodium and tin. 14 ref.
(L17, 1-2, Q general; *Ni, Cr, Rh, Sn*)

230-L. Electrodeposition From Sulphamate Solutions. Pt. 4. Cadmium. J. Mathur and T. L. Rama Char. *India Section the Electrochemical Society, Bulletin,* v. 6, Jan. 1957, p. 6-10.

The optimum conditions have been established for the electrodeposition of cadmium from the sulphamate bath. Its performance is satisfactory over a wide range of experimental conditions. 13 ref. (L17a; Cd)

231-L. Anodic Behaviour of Copper in Aqueous Solutions. Donald J. Royer, Jacob Kleinberg and Arthur W. Davidson. *Journal of Inorganic and Nuclear Chemistry,* v. 4, Mar. 1957, p. 115-127.

The anodic oxidation of copper in a variety of aqueous electrolytes has been investigated. In the presence of agents (e.g., cyanide, chloride, sulphate ions) which form stable complexes with copper (I) the metal enters solution solely in the unipositive state over a wide concentration range of electrolyte.
(L19, P12e; Cu)

232-L. Electrodeposition From Sulphamate Solutions. Pt. 1. Nickel. S. Sathyanarayana and T. L. Rama Char. *Journal of Scientific and Industrial Research,* v. 16 A, Feb. 1957, p. 78-85.

The sulphamate bath has been found to be satisfactory for the plating of nickel. It gives good quality deposits over a wide range of experimental conditions and is comparable to the sulphate bath. 30 ref.
(L17a; *Ni*)

233-L. Electrodeposition From Sulphamate Solutions. Pt. 2. Zinc. S. Sathyanarayana and T. L. Rama Char. *Journal of Scientific and Industrial Research,* v. 16A, Feb. 1957, p. 86-90.

Optimum conditions have been established for the electrodeposition of zinc from the sulphamate bath. The bath is comparable in performance to the sulphate bath. 18 ref.
(L17a; Zn)

234-L. Proper Cleaning Methods Pay Dividends. Lester F. Spencer. *Metal Finishing,* v. 55, Apr. 1957, p. 56-61.

Factors determining efficiency of metal cleaning operation are the cleansing agent, method of procedure and equipment. Suggestions for selections. (L12)

235-L. Coatings for Protection of Electroplating Equipment. Michael Perze. *Metal Finishing,* v. 55, Apr. 1957, p. 62-64.

Notes on properties and application of coatings available for protecting plating equipment including rubber sheeting, hot dip coating such as waxes, solvent-type coatings and plastisols. (L26p, L26q, L26r, W3)

236-L. Surface Treatment and Finishing of Light Metals. Pt. 12-D. Plating on Aluminum — the Vogt Process. S. Wernick and R. Pinner. *Metal Finishing,* v. 55, Apr. 1957, p. 68-71.

Preparatory treatment and plating sequence consisting of zinc, brass, nickel and chromium plating on aluminum hollow-ware and heat treatment following nickel and chromium plating for Vogt process and its modifications. (L17; Al, *Ni, Cr*)

237-L. Science for Electroplaters. Pt. 23. Chemical Surface Preparation. L. Serota. *Metal Finishing,* v. 55, Apr. 1957, p. 72-73.

Discussion of alkaline cleaning and surface active agents includes soap tank and electrolytic cleaning baths.
(L12k, L13n)

238-L. Finishing Supplement. Pt. 3. Degreasing. *Metal Industry,* v. 90, Mar. 22, 1957, p. 229-231.

Informal discussion held by Institute of Metals about the use of trichlorethylene and ultrasonic cleaning for metal surfaces. (L12h, L10f)

239-L. Electroplating of Zinc Die Casting. Earnest Hornvich. *Metal Products Manufacturing,* v. 14, Apr. 1957, p. 68-70.

Purpose of electroplating, cleaning the castings, determining the optimum coating thickness.
(L17; Zn, 5-11)

240-L. How Lining With Inconel Combats Digester Corrosion. J. F. Nation and J. M. Tull. *Paper Industry,* v. 39, Apr. 1957, p. 33-36.

Use of Inconel cladding in pulp industry for corrosion resistance; techniques of Inconel lining and results. (L22, T29r; Ni)

241-L. How to Care for Stainless Steel. James H. Hunter. *Textile Industries.* v. 121, Mar. 1957, p. 124-125.

Stainless steel maintenance problems are enumerated and corrective steps suggested. (L12, 18-21; SS)

242-L. Ultrasound Cleaning With Magnetostrictive Vibrators. H. J. Gollmick and K. Tesser. *Henry Brutcher Translation* no. 3828, 5 p. (From *Metalloberfläche*, v. 10, no. 8, 1956, p. 233-237.) Henry Brutcher, Altadena, Calif.

Previously abstracted from original. See item 644-L, 1956. (L10)

243-L. (French.) **Method for the Treatment of Corrosion of the Surface of Magnesium Castings—Some Preliminary Results on the HAE Method.** G. Nordell and I. Weibull. *Corrosion et Anticorrosion*, v. 5, Feb. 1957, p. 58-60.

Explains a new coating for magnesium already in use in the United States. Equipment and method of treatment; effect of the anodic (HAE) coating on fatigue strength. 4 ref. (L19, 1-3, Q7a; Mg, 5)

244-L. (French.) **Plastic, Protective Bands Used Against Corrosion.** Werner Kirsch and Lucien Remy. *Corrosion et Anticorrosion*, v. 5, Mar. 1957, p. 82-88.

This easily applied form of protection presents a particular interest in the case of buried metal piping. Several varieties of bands are described—in natural fibers, glass fiber and synthetic materials; outlines applications and behavior characteristics. (L26p, R8; 4-10)

245-L. (French.) **Preparation Before Electroplating of Die-Cast Zinc Parts.** *Galvano*, no. 242, Mar. 1957, p. 21-24.

Determination and performance of preparatory processes before electroplating of zinc castings conforming to ASTM B86 and ASTM B142. Electrolytic deposits of nickel and chromium on zinc and zinc-base alloys are discussed.
(L17, L10, L12; Zn, 5-11)

246-L. (French.) **Choice, Control and Use of Bright Nickel Plating Solutions.** *Galvano*, no. 242, Mar. 1957, p. 29-34.

Differences in technique for achieving bright and dull nickel finishes; types of fully bright and semibright solutions; control of the principal constituents of the baths; consideration of the cleaning cycle. (To be continued.) (L17a; *Ni*)

247-L. (French.) **A Surface Treatment Plant.** *Galvano*, no. 242, Mar. 1957, p. 35-37.

Layout and operations of the Modern Plating Co.'s plant at Los Angeles. (L17, 18-17)

248-L. (French.) **Silver Plating and Gilding of Zamak.** *Galvano*, no. 242, Mar. 1957, p. 39-40.

Notes the excellent market for die-cast Zamak articles such as paper knives; discusses the extensive possibilities offered for the coating of zinc alloy die castings with precious metals; outlines processes involved—casting, degreasing, silvering, gilding and types of baths used. (L17; Zn, *Ag, Au*, 5-11)

249-L. (French.) **Galvanizing by the Continuous Process.** *Metallurgie et la Construction Mecanique*, v. 89, Mar. 1957, p. 249-251.

Outline of the Sendzimir process and the equipment involved; heat treatment of sheet iron; chemical reactions; working procedures.
(L16, 1-11, F23; Fe, Zn)

250-L. (French.) **Surface Treatment of Aluminum and Its Alloys. Pt. III. Electrolytic Treatments—Anodic Oxidation Processes Other Than the Sulphuric Process.** Charles Etienne and Francois Flusin. *Revue de l'Aluminium*, no. 241, Mar. 1957, p. 295-301.

The oxide-dissolution equilibrium which, for a given electrolyte, governs the conditions of the electrolysis (concentration, temperature, current density, time) can be modified by a change in the nature of the electrolyte. The oxide films thus obtained can offer special properties. Description of the electrolytes when sulphuric acid is the main constituent with additions of acetic acid, glycerin, chromic acid, magnesium chloride, oxalic acid. Chromic acid baths and oxalic acid baths.
(L19p, L19q; Al)

251-L. (German.) **Flame Cleaning.** H. Wiegand, F. Nieth and K. W. Sippell. *Metalloberfläche*, v. 11, Apr. 1957, p. 109-114.

Flame cleaning technique; determination of temperature peaks and dissipation and their dependence and importance in successful cleaning. 6 ref. (L10g)

252-L. (German.) **Flame Cleaning of Rolled Sheet Metal.** H. Wiegand, F. Nieth and W. Neuhaus. *Metalloberfläche*, v. 11, Apr. 1957, p. 114-119.

Experiments on rolled sheet of various thicknesses and composition; removal of scale in relation to composition of scale; scale and sheet thickness; scale thickness as dependent on number of passes and rolling temperature; composition dependent on sheet thickness, number of passes and casting method. 7 ref. (L10g, F23; 4-3)

253-L. (German.) **Flame Cleaning of Black Plate.** Werner Neuhaus and

K. W. Sippel. *Metalloberfläche,* v. 11, Apr. 1957, p. 120-127.

Results of an acetylene-oxygen flame on 100 sheets of black plate of varying composition. 6 ref. (L10g; ST, 4-3)

254-L. (German.) **Suitability of Various Flammable Gases for Rust Removal or Flame Cleaning.** H. Wiegand and F. Nieth. *Metalloberfläche,* v. 11, Apr. 1957, p. 129-135.

Results in the use of acetylene, propane, hydrogen and illuminating gas for flame cleaning and removal of rust; amounts of gas and oxygen used; temperature gradients obtained. 8 ref. (L10g; RM-m)

255-L. (Italian.) **Use of Automatic Submerged Arc Welding in Surfacing Operations.** Oscar Grossi. *Ingegneria Meccanica,* v. 5, Nov. 1956, p. 55-63.

General nature of surfacing by this process; details of surfacing operations on crane wheels, railroad car wheels and rolling mill rolls. (L24, K1e)

256-L. (Italian.) **Ceramic Coatings for Metals Subjected to High Temperatures.** *La Ceramica,* v. 12, Jan. 1957, p. 51-53.

Problems of effect of high temperatures can be solved variously by use of special metals, cooling of affected parts, substitution of nonmetallic parts and protective coatings. Description of "Rokide" coating using alumina, zircon and oxide of zircon; comparison of characteristics of these coatings with stainless steel; applications. (L27, 2-12)

257-L. (Italian.) **Researches on the Electrochemical Behavior of Tin. Note II—Solutions Containing Fluorions.** U. Bertocci and G. Serravalle. *Metallurgia Italiana,* v. 49, Feb. 1957, p. 95-98.

The kinetic behavior of both cathodic and anodic tin in fluorhydric and fluorhydrochloric solutions investigated with regard to the formation of fluorine compounds. Study of the influence of the concentration of the complexing agent and of the acidity and temperature. 3 ref. (L17; Sn)

258-L. (Italian.) **Electrodeposition of Sn-Ni and Sn-Sb Alloys.** G. Serravalle. *Metallurgia Italiana,* v. 49, Feb. 1957, p. 99-106.

Study of the electrochemical behavior of tin, nickel and antimony in solutions containing fluorions. The electrochemical aspects of the separation of nickel, tin and tin-antimony alloys. On the basis of results obtained, an interpretation of the electrodeposition of these alloys and of their electrodic behavior has been formulated. 5 ref. (L17, C23; Sn, Ni, Sb)

259-L. (Japanese.) **Effects on the Thermal Shock Resistance of Ceramic Coating of Nickel-Flash and Mill Addition of Cobalt Oxide Fired in Nitrogen Stream.** Chihiro Kawashima and Yorihiro Murata. *Ceramic Association, Japan, Journal,* v. 60, no. 735, Mar. 1, 1957, p. 31-40.

Most effective addition is 3% CoO, since selective galvanic corrosion occurs at this content. When the galvanic corrosion of cobalt monoxide and reducing action of nickel flashing act simultaneously during enameling, these factors cancel each other so that both thermal-shock resistance and adherence strength greatly decrease. (L27, 2-10, Q10a)

260-L. (Swedish.) **Descaling in Connection With Hot Rolling.** Gunnar Nyberg. *Jernkontorets Annaler,* v. 141, no. 1, 1957, p. 37-59.

Descaling with high-pressure water spray; investigations of different types of nozzles; importance of suitable pressure and of direction of jet. (L12, F23, 1-16; ST)

261-L. (Book—French.) **Treatise on Electroplating.** J. Salauze. 819 p. 1956. Dunod, 92 Rue Bonaparte, Paris 6e, France. 5900 Fr.

Theoretical analysis of electrolytic dissociation, potentials, polarization and formation of deposits, accompanied by detailed practical discussion of baths, preparation of pieces (scouring, degreasing, etc.), equipment used, nature of coatings, protection offered against corrosion. Surveys metals ranging from silver and copper to lead, tin, nickel, zinc, aluminum and magnesium with some reference to alloys. (L17)

262-L. **Low Temperature Descaling Safeguards Titanium Properties.** I. Stambler. *Aviation Age,* v. 27, May 1957, p. 130-133. (CMA)

Turco Products (Los Angeles) has developed a low-temperature descaling method which gives chemical cleanness, low hydrogen pick-up, low metal loss, passive surface activity, intergranular attack and improved smoothness. After precleaning, the parts are alkaline-cleaned in Turco 4272 scale remover and in Vitro-Klene or Petro-Klene, rinsed, and acid-cleaned in HNO_3. (L12, 2-13; Ti)

263-L. Electrolysis Cleans Titanium. *Aviation Week,* v. 66, May 13, 1957, p. 79, 81. (CMA)

Temco Aircraft (Dallas) uses the "Ti-Brite" electrolytic process to descale and degrease titanium aircraft parts. Surface qualities are improved and there is no etching effect. The immersion bath contains 1% of 48-70% HF, 4% of 38-46° Bé HNO_3, 20% of 60-66° Bé H_2SO_4 and 75% water; 3-5 oz. of ferrous or aluminum sulphate are also present. The d.c. voltage is 6-36 volts. After immersion for 1-3 min. the polarity is reversed. The part is then removed and wiped clean. (L13n; Ti)

264-L. Protective Coating of Titanium. C. L. Stanley and A. Brenner. *Light Metal Age,* v. 15, Apr. 1957, p. 27-28. (CMA)

A protective coat of chromium may be plated on a titanium surface if the oxide film is supplanted with a fluoride film before plating. After 10-15 min. of suspension in hydrofluoric-acetic acid bath and 10 min. of 60-cycle a.c., the specimens are rinsed and removed to a typical chromium plating bath where they are plated at 85° C. and 120 amp. per sq. dm. They are then heat treated at 800° C. for 2 min. in inert atmosphere. Adhesion of the plates is good. (L17; Ti, *Cr*)

265-L. Anodic Oxidation of Some Dilute Binary Zirconium Alloys. G. B. Adams, Jr., C. E. Borchers and P. Van Rysselberghe. *U.S. Atomic Energy Commission,* AECU-3388, Jan. 1, 1957, 26 p. (CMA)

The anodization of zirconium alloy electrodes was performed in a cell, which is described and the circuitry of which is diagrammed. Potential-time data for alloys with columbium, nickel, iron, copper, tin and chromium (to a total of nine) were obtained for three current densities. Electrolytic parameters and local currents were calculated. 4 ref. (L19, 1-2; Zr, *Cb, Ni, Fe, Cu, Sn, Cr*)

266-L. (German.) **Protection of Molybdenum Against Oxidation at High Temperature.** Karl Wassmann. *Verin deutscher Ingenieure, Zeitschrift,* v. 99, Apr. 1, 1957, p. 423-425. (CMA)

Problem of protecting molybdenum surfaces against oxidation at elevated temperatures is discussed. No molybdenum alloy has been found that would correct the inability of molybdenum to form a protective oxide film. It is therefore necessary to resort to coatings which may be either inert themselves (like ceramics or certain metals) or oxidizable into an inert protective layer. Such coatings can be applied by spraying. The best experimental results have been obtained with chromium, chromium-nickel and aluminum-chromium-silicon, giving protection up to 1100° C., and with molybdenum sulphide for temperatures above 1300° C. (L23; Mo)

267-L. Painting of Steel Structures in Petroleum Refineries. J. O. Jackson and Joseph Bigos. *American Petroleum Institute, Proceedings,* v. 36 (III), 1956, p. 34-48.

Proper design and surface preparation, correct application, selection and formulations of paint for structural steel to prevent corrosion. (L26n; ST, SGA-s)

268-L. Finishing Polished Metal Parts for Rembrandt Lamps. Edward Ciebien. *Industrial Finishing,* v. 33, Apr. 1957, p. 48-52.

Procedure and precautions in buffing, degreasing and lacquering metal lamp parts. (L10a, L12, L26n)

269-L. Epoxy Coatings for Metal Products. R. E. Dunbar. *Materials and Methods,* v. 45, Apr. 1957, p. 130-134.

Composition, properties, methods of application and typical uses of the six main types of formulations. Coatings are noted for excellent adhesion, flexibility, toughness and chemical resistance. (L26p)

270-L. Plating With Insoluble Anodes. Edward R. Jorczyk. *Metal Finishing,* v. 55, Mar. 1957, p. 46-49.

With the use of insoluble anodes, installation of a silver concentration tank eliminated solution decomposition, maintained an even silver content of solution and kept carbon treatments to a minimum. (L17, W3h, 1-2)

271-L. Finishing Nickel and High Nickel Alloys. Lester F. Spencer. *Metal Finishing,* v. 55, Mar. 1957, p. 50-55; disc., p. 61.

Operational procedures for finishing wrought nickel, Monel and Inconel. Details as to wheel type, wheel speeds and specific examples of finishing are discussed. (L general, G18; Ni)

272-L. Bright Nickel Plating. I. R. Bellobono. *Metal Finishing Journal,* v. 3, Mar. 1957, p. 111-117; disc., p. 127.

Coordination compounds and the plating potentials of metals in relation to the theories propounded to account for bright nickel plating. 27 ref. (L17; *Ni*)

273-L. Anodising and Brightening of Aluminium and Its Alloys. A. W. Brace. *Metallurgia,* v. 55, Apr. 1957, p. 173-185.

Composition and operating conditions of main electro brightening, electropolishing and chemical brightening and anodizing processes; their merits and limitations, influence of composition and effect of metallurgical structure in response to brightening and anodizing. 27 ref. (L13, L19; Al)

274-L. Plating Steel With Molybdenum. *Steel,* v. 140, May 20, 1957, p. 161, 164. (CMA)

A successful vapor-plating experiment is described which involved surfaces of AISI 4620 steel and $MoCl_5$ vapor. Thin underplatings of cobalt were used and were better than those of copper and nickel. The surface is heated to 1607-1787° F. The $MoCl_5$ vaporizer operates at about 482° F. and discharges an argon stream saturated with $MoCl_5$ vapor which is reduced by a stream of hydrogen in a burner near the plate. Hydrogen-rich mixtures give dense, well-bonded plates which are heat and erosion-resistant. (L25; ST, *Mo*)

275-L. (English.) **Cleaning of Aluminum Articles by Alkaline Solutions and Works Control of This Operation.** M. N. Rozov and T. A. Trainina. *Journal of Applied Chemistry of the USSR,* v. 29, June 1956, p. 975-983. (Translated by Consultants Bureau, Inc., 227 W. 17th St., New York 11, N.Y.)

Deals with kinetics of the process. (L12k; Al)

276-L. (English.) **Investigation of the Anode Process in the Aluminum Bath.** L. N. Antipin and A. N. Khudyakov. *Journal of Applied Chemistry of the USSR,* v. 29, June 1956, p. 985-990. (Translated by Consultants Bureau, Inc., 227 W. 17th St., New York 11, N.Y.)

Detailed study has been made of the relationship between the anode gas composition and the polarization on the one hand and the current density on the other. (L19; Al)

277-L. It Is Cheaper by Tumbling. Leon E. Laux. *Metal Finishing Journal,* v. 3, Feb. 1957, p. 67-70.

Operational costs of barrel finishing by the Glenn L. Martin Co. About 95% of parts tumbled are aluminum alloys. (L10d; Al)

278-L. Continuous Electrolytic Oxidation of Aluminum Wire and Strip. H. Richaud. *Metal Finishing Journal,* v. 3, Feb. 1957, p. 71-74.

Two continuous methods are described; oxidation for electrical insulation and oxidation for decorative purposes. (L19; Al, 4-3, 4-11)

279-L. Suitability of Fusion-Welding Processes for Vitreous-Enamelling. B. Trehearne. *Metal Finishing Journal,* v. 3, Feb. 1957, p. 79-82.

Some of the factors influencing quality of vitreous enamel on fusion-welded sheet metal are considered. Four methods of fusion welding and the results of experiments are discussed. Relationship between weld defects and enameling defects was established by X-ray examination. (L27, K general; 9)

280-L. Feasibility of Roll Cladding Titanium on Steel. Summary Report for Nov. 1, 1955 to Dec. 31, 1956. R. F. Domagala and D. W. Levinson. *U.S. Atomic Energy Commisssion,* AECU-3431, Dec. 31, 1956, 71 p. (CMA)

Titanium may be roll clad onto plain carbon steel if a diffusion barrier of vanadium is interposed between the metals. These "sandwiches" are hot rolled to sheet at 850-1000° C. Bend and shear strengths of the sheet are great, and anneals at 750° C. for 1000 hr. do not affect the quality. A vanadium-iron phase, probably sigma, is observed at the interface unless a thin layer of copper is placed between the vanadium and steel. Similarly clad stainless steel was satisfactory. (L22; ST, *Ti, V*)

281-L. Metal Spraying in Inert Atmospheres. R. E. Monroe, O. C. Martin and C. B. Voldrich. *U.S. Atomic Energy Commission,* BMI-994, Dec. 17, 1953, 21 p. (CMA)

Metal-arc spraying of zirconium coats on uranium was studied. The defects of the as-sprayed coat—porosity and unflattened spray particles—were overcome by a diffusion heat treatment. An arc between two consumable electrodes is fed through a high-velocity gas blast and an inert atmosphere is used. The method has been abandoned since other methods have been studied. (L23; U, *Zr,* 9-18)

282-L. Development of a Cubic Oxide Protective Film on Zirconium. J.

R. Johnson. *U.S. Atomic Energy Commission,* ORNL-2029, Feb. 21, 1955, 7 p. (CMA)

The more stable (to neutrons) cubic form of ZrO_2 may be developed in preference to the monoclinic form by alloying zirconium with a metal which forms a cubic oxide. Columbium is the most promising and is amenable to forging and processing. The metal chosen must form a cubic phase in other corrosion environments, form an oxide at low temperatures and, as the oxide, have a stable cubic form.
(L14a, M26r; Zr, *Cb*)

283-L. **Influence of Heat Treatment on the Properties of Chemical Nickel Coatings Produced by the Kanigen Process.** Van Royen. *Electroplating and Metal Finishing,* v. 10, Apr. 1957, p. 114-115.

Structure of chemical nickel deposits produced by the nickel phosphorus process and the effect of various heat treatments on their corrosion resistance and mechanical properties.
(L28, M27, Q general, R general, 2-14; *Ni*)

284-L. (French.) **Electrolytic Galvanizing of Steel Sheets.** F. H. Smith. *Corrosion et Anticorrosion,* v. 5, Jan. 1957, p. 10-18.

Characteristics and advantages of this process; corrosion resistance compared with other coatings; techniques used in England and the United States; applications, including aptitude for machining and welding. (L16; ST, *Zn,* 4-3)

285-L. (French.) **Surface Treatment Before Painting or Temporary Coating of Such Metals as Steel, Aluminum, Zinc.** C. Hess. *Corrosion et Anticorrosion,* v. 5, Jan. 1957, p. 19-24.

Chemistry of surface treatments, and types of coating and protection afforded.
(L general; ST, Al, Zn)

286-L. (French.) **Protection of Motor Truck Tankers by Means of Neoprene Base Coatings.** G. de Laberbis. *Corrosion et Anticorrosion,* v. 5, Jan. 1957, p. 25-26.

Applicable either in sheet or liquid form, neoprene affords excellent protection against concentrated caustic soda in tank trucks. Cites successful use of this product in the United States. (L26r R6j)

287-L. (French.) **Treatment of Surfaces for Galvanizing: Pickling.** A. Herz. *Metallurgie et la Construction Mecanique,* v. 89, Apr. 1957, p. 355-357.

Pickling in sulphuric acid; effects of strength of concentration and temperature; pickling by hydrochloric acid; pickling of cast iron. (L12g; L16; *Zn*)

288-L. (German.) **Galvanizing of Screws and Other Small Parts. Pt. IV.** Werner Peters. *Draht,* v. 8, Apr. 1957, p. 127-131.

Quality control, including thickness of the layer, corrosion resistance and gage accuracy are discussed, as well as calculations given for the complete galvanizing process. 3 ref. (L16, T7f, 17-7; *Zn*)

289-L. (German.) **Chemical and Electrochemical Treatment of Corrosion Resistance Steels.** O. P. Krämer. *Metallwaren-Industrie und Galvanotechnik,* v. 48, Apr. 1957, p. 148-152.

Details of pickling, electrolytic pickling, protective coating, burnishing and coloring.
(L general; ST, SGA-g)

290-L. (German.) **Ball Polishing.** M. Dreher. *Metallwaren-Industrie und Galvanotechnik,* v. 48, Apr. 1957, p. 160-164.

Choice of suitable metals, surface characteristics and shape, preparatory treatment, time necessary for polishing and applications of methods. (L10d)

291-L. **Highly-Conducting Gold Films Prepared by Vacuum Evaporation.** A. E. Ennos. *British Journal of Applied Physics,* v. 8, Mar. 1957, p. 113-117.

Thin gold films formed by vacuum evaporation on freshly evaporated layers of certain metallic oxides show high conductivity in a similar way to layers prepared by cathodic sputtering. The evaporated layers are robust and of high current-carrying capacity down to 30-Angstrom thickness. The conductivity approaches the bulk value for annealed films thicker than 60 Angstroms. Properties of these films discussed in relation to those of the sputtered layers, with which they compare favorably. 9 ref.
(L25g; Au)

292-L. **Dyeing of Anodised Aluminium.** B. L. Sen. *Indian Textile Journal,* v. 67, Jan. 1957, p. 236.

Aluminum in its pure form can conveniently be employed for dyeing with synthetic dyestuffs; brief procedure is presented. (L19; Al)

293-L. Surface Treatment and Finishing of Light Metals. Pt. XII-C. Plating on Aluminum-Zinc Immersion Processes. S. Wernick and R. Pinner. *Metal Finishing,* v. 55, Mar. 1957, p. 58-61.

Typical flow sheet for plating by zinc-immersion. Discussion of platings which include copper, zinc, brass, cadmium, silver and chromium, applied directly on the zinc immersion deposit. (L17; Zn)

294-L. Zinc Coatings. Complete Corrosion Protection at Lowest Over-All Cost. F. P. Helms. *Oil and Gas Journal,* v. 55, Apr. 8, 1957, p. 106-109.

Some cost comparisons for different protective methods; galvanizing, zinc silicate formulations, high-temperature deposition of zinc dust. (L16, L general; *Zn*)

295-L. Electroless Plating, Electro Forming, Mark Progress. Fred W. Huntington. *Pacific Factory,* v. 87, Mar. 1957, p. 43.

Recent developments in plating and metal finishing. (L28, L18)

296-L. Diffused Chrome Alloy Finishing Process. John Starr. *Pacific Factory,* v. 87, Mar. 1957, p. 44-45.

Diffusion of chromium in ferrous parts so as to produce coatings which are alloys of the parent metals. (L15; *Cr*)

297-L. AES Research Program. Robert A. Ehrhardt. *Plating,* v. 44, May 1957, p. 489-509.

Brief account of American Electroplaters' Society research program. Summaries of progress for the following projects: Stripping copper from base metals, preparation for plating, adhesion, porosity, effect of impurities in plating solutions, mechanical finishing, testing thickness of deposits, and accelerated corrosion testing. (L17, A9)

298-L. Fundamentals of Diffusional Bonding. Pt. I. L. Castleman and L. Seigle. Sylvania Electric Products, Inc. *U.S. Atomic Energy Commission,* SEP-227, Aug. 13, 1956, 38 p.

Formation of intermediate layers in the diffusion zone of Al-Ni diffusion couples. This system was chosen because of its significance in fuel element technology. It has been confirmed that only two out of four possible layers form observably during diffusion—the Ni_2Al_3 and $NiAl_3$ phases. 16 ref. (L22, N1; Al, Ni)

299-L. Study of the Feasibility of Coating Magnesium With High-Purity Aluminum. C. F. Powell and I. E. Campbell. Battelle Memorial Institute (Wright Air Development Center). *U.S. Office of Technical Services,* PB 121860, Nov. 1956, 28 p. $.75.

Feasibility of the vapor plating technique was investigated through a literature survey of aluminum compounds sufficiently unstable to be decomposed to yield aluminum metal at suitable plating temperatures. Most promising for further experimentation was pyrolysis of aluminum alkyls and of aluminum hydride and its derivatives at low pressures and at temperatures of 400 to 500° C. (L25; Mg, *Al*)

300-L. (Czech.) **Metallurgical Surface Treatment of Tin Plate.** J. Teindl and Antonin Hrbek. *Hutnické Listy,* v. 12, Apr. 1957, p. 329-332.

Studies on the oxidation of tin plate and the use of protective oxide coatings; recommendations for improving the resistance to corrosion. (L14a; *Sn,* 8-12)

301-L. (French.) **Kanigen Chemical Nickel Plating Process.** *Revue des Produits Chimiques,* v. 60, Feb. 28, 1957, p. 45-51.

History of process, theory, work done by General American Transportation Corp. to perfect process, properties of chemical nickel deposits, details on anticorrosion protection provided by such coating, applications. (L28; *Ni*)

302-L. (German.) **Ion Exchangers in Plating Technology.** Gunnar Gabrielson. *Metalloberfläche,* v. 11, Feb. 1957, p. 41-46.

Fundamental properties of ion exchange resins; technique of ion separation by means of ion exchangers; instruction for the selection of ion exchangers; application of ion exchangers in the analysis of plating solutions; characteristic data of some commercial ion exchange resins. 25 ref. (L17, A8b)

303-L. (German.) **Anodic Oxidation of Copper and Copper Alloys.** Hans Edner. *Metallwaren-Industrie und Galvanotechnik,* v. 48, Apr. 1957, p. 157-159.

Anodic dyeing of copper and its alloys is easier than blackening by other methods. Oxide layers are up to 3 microns thick, easily polished and heat resistant up to 200° C. (L19; Cu)

304-L. (German.) **Semi and Fully Automatic Grinding and Polishing.** O. Schleppi. *Metallwaren-Industrie und Galvanotechnik,* v. 48, Apr. 1957, p. 165-169, 188.

Choice of polishing emulsion or paste. Polishing wheel as applied to the use of European machinery (in contrast to equipment used in the United States). (L10b, 1-2)

305-L. (German.) **Theory and Engineering of Flame Cleaning.** Karl W. Sippell. *Werkstoffe und Korrosion,* v. 8, Apr. 1957, p. 185-216.

Influence of the flame temperature upon the properties of structural steels and the influence of several fuel gases upon the effectiveness of the method. 78 ref. (L10g; ST)

306-L. (Book—Spanish.) **Hard Chromium Plating; Practice and Applications.** Vincente Massuet Grau. 288 p. 1957. Editorial. J. Monteso, Barcelona, Spain.

Practical guide for metallurgist not familiar with electryoltic processes. In four parts: electrolytic chromium; plant and equipment; hard chromium plating practice; and industrial applications. (L17; *Cr*)

307-L. **Surface Protection by Coating.** *Australasian Manufacturer,* v. 41, Mar. 30, 1957, p. 76-82.

A ceramic coating affording thermal, erosion and electrical protection for metal and other surfaces is described. (L27)

308-L. **Red Lead in the Protection of Iron and Steel. Pt. 4.** H. Masseille. *Corrosion Prevention & Control,* v. 4, Mar. 1957, p. 37-39.

Durability of red lead linseed oil paints and their resistance to sea water; recommendations for surface preparation and application. (To be continued.) (L26n, R4b; ST)

309-L. **Shotblasting Developments in Metal Surface Preparation.** J. Carle. *Corrosion Prevention & Control,* v. 4, May 1957, p. 49-55.

Broad applications of shot blasting, including application to continuous steel strip, steel sheets, internal surfaces of ingot molds, welded fabrications, steel castings and gray iron castings. (L10c; ST, CI)

310-L. **Roto-Finish Precision Barrelling.** R. C. Liebman. *Corrosion Prevention & Control,* v. 4, May 1957, p. 59-61.

Processing equipment, economic and performance advantages. (L10d, 1-2)

311-L. **Repair of Car Parts by Chromium Plating.** A. W. Rykowa and W. Summer. *Corrosion Technology,* v. 4, Apr. 1957, p. 113-116.

Data from Russian source on the use of chromium plating for reducing wear and building up worn automobile parts. Results from microhardness, bending, tensile and wear tests on chromium plated steel specimens. (L17, Q9n; ST, *Cr*)

312-L. **Metal Pre-Treatment by the Sodium Hydride Process.** *Corrosion Technology,* v. 4, Apr. 1957, p. 128.

Note on sodium hydride descaling process; range of process applications and advantages. (L12n)

313-L. **Vitreous Enamelling Brings Colour to the Home.** *Industrial Finishing,* v. 9, Mar. 1957, p. 438-442.

Production of colored frit and its use in vitreous enameling of sheet iron for gas kitchen stoves. (L27, T10a, 17-7; Fe, 4-3)

314-L. **Application of Nickel Plating.** *Industrial Finishing,* v. 9, Mar. 1957, p. 443-450.

Relation of coating thickness and quality to current density and plating bath contamination; suggestions for obtaining desired thickness and maintaining bath purity; types of nickel plating baths and applications. (L17; Ni)

315-L. **Avoiding De-Wetting of Tin Coatings.** M. C. Chevalier. *Industrial Finishing,* v. 9, Mar. 1957, p. 460.

De-wetting defects occurring during tinning of steel by dipping are prevented by oxidizing the steel surface; methods of oxidizing include roasting at dull red heat, oxidation in air and nitric acid pickling. (L14a, L12g, L16; Sn)

316-L. **Plant for Nickel Plating.** *Industrial Finishing,* v. 9, Apr. 1957, p. 503-510.

Plant layout, type of equipment, process variables and testing methods for thickness, ductility, corrosion resistance and adhesion. Physical properties of several commercially pure electrodeposited metals. (L17, 1-2, 18-17)

317-L. **Finishing Spheroidal Graphite Iron Castings.** *Industrial Finishing,* v. 9, Apr. 1957, p. 516.

Note on possibilities for finishing and coating spheroidal graphite iron castings. (L general; CI-r)

318-L. Organic Coatings for Die Castings. *Industrial Finishing,* v. 9, Apr. 1957, p. 523.

Types of finish available for die-castings and methods of application. (L26; 5-11)

319-L. Vacuum Metallising. Derek J. T. Kennedy. *Industrial Finishing,* v. 9, May 1957, p. 554-559.

Applications, principles of the process, including system of pumping and plant maintenance. (L23, 1-23)

320-L. Survey of Chromate Treatments. Walter E. Pocock. *Industrial Finishing,* v. 9, May 1957, p. 561-568.

Pretreatment, properties, application to zinc, cadmium, copper, aluminum and magnesium. (L14c; Zn, Cd, Cu, Al, Mg)

321-L. Alloy Plating: Which Way Is It Headed? F. A. Lowenheim and R. T. Gore. *Iron Age,* v. 179, Apr. 25, 1957, p. 112-113.

Current research in alloy plating field includes mention of tin-zinc, tin-cadmium, tin-nickel, tin-lead, tin-cobalt, tin-copper-zinc combinations and several non-tin alloys for which plating possibilities are being investigated. (L17; Sn)

322-L. Continuous Anodizing of Aluminum Wire for Insulation. G. E. A. Bramley and N. D. Pullen. *Light Metals,* v. 20, May 1957, p. 148.

History of development, applications and advantages over enameled copper wire. (L19, T1b; Al)

323-L. On the H.A.E. Process for the Protection of Magnesium-Rich Alloys. W. F. Higgins. *Light Metals,* v. 20, May 1957, p. 150-151.

HAE coating is not a general purpose palliative, but a special process to be used where the end justifies the cost. In United Kingdom the HAE treatment is slower to commend itself than in the United States. (L17; Mg)

324-L. Decorative Anodic Finishes. Peter Smith. *Light Metals,* v. 20, May 1957, p. 165.

Brief survey and application of types including natural (or silver) and colored finishes produced on aluminum and its alloys. (L19; Al)

325-L. Production and Properties of Opaque Coatings by Chromic Acid Anodizing. A. W. Brace and R. Peek. *Light Metals,* v. 20, May 1957, p. 166-167.

Effects on film thickness of anodizing voltage, electrolyte temperature and concentration. (L19p; Al)

326-L. Electroplating of Zinc Die Casting. Pt. 2. Ernest Horvick. *Metal Products Manufacturing,* v. 14, May 1957, p. 59-61.

In chromium, nickel and copper plating of zinc. (L17; Zn, *Cr, Ni, Cu,* 5-11)

327-L. Plating on Aluminum Bronze. I. William Marcovitch. *Plating,* v. 44, Apr. 1957, p. 387.

Note on cleaning and plating procedure for plating nickel on aluminum bronze. (L17, L12; Cu, *Al, Ni*)

328-L. Microthrowing Power. A Literature Search. Esther B. Leffler and Henry Leidheiser. *Plating,* v. 44, Apr. 1957, p. 388-396.

Section on definitions of terms; experimental work on microthrowing power and leveling; theoretical work concerned with deposition within isolated recesses and cavities. 46 ref. (L16b)

329-L. Electrolytic Cleaning and Descaling of Wire. R. Beck. *Wire Production,* v. 6, Mar. 1957, p. 5-7.

Advantages and disadvantages of a new process. (L13n; 4-11)

330-L. Protection of Uranium: Vapor-Deposited Coatings. I. E. Campbell, et al. *U.S. Atomic Energy Commission,* BMI-887, Nov. 24, 1953. 19 p. (CMA)

Satisfactory vapor-deposited coatings were obtained on uranium by a displacement-diffusion process (pack-zirconizing) using ZrI_2 and ZrI_3 vapors. A 24-hr. treatment at 1050° C. gave coats 5.9 mils thick which were adherent, nonporous and corrosion resistant to boiling water for 500 hr. The composition of the coat is uncertain. Molybdenum can be deposited from $Mo(CO)_6$. Deposits from VI_2 are anticipated. Work with ZrI_4 was abandoned. (L25; U)

331-L. Anodic Oxidation of Zirconium at Low Potentials: Effect of Electrolyte Composition. G. B. Adams, Jr., C. E. Borchers and P. Van Rysselberghe. *U.S. Atomic Energy Commission,* AECU-3432. Mar. 1, 1957. 21 p. (CMA)

Effect of electrolyte type and concentration on the unitary formation rate for the anodizing of zirconium at low potentials was studied. Apparatus and procedure described.

The numerous electrolytes covered were alkali bromides, hydroxides, iodides, chlorides, chlorates, nitrates and sulphates, alkaline earth chlorides and nitrates, ammonium borate, acetate and hydroxide, tetramethyl ammonium bromide, and perchloric, nitric and acetic acids. The rates are given for each electrolyte and concentration. Variations in the unitary rate are not as definite for anions as for cations. Increasing electrolytic conductance always results in a decreased formation rate. The electrolyte should be presaturated with the metal oxide by high-temperature anodization.
(L19; Zr)

332-L. Further Development of Phosphatizing to a Sludge-Free Process. F. Rossteutscher. *Henry Brutcher Translation* No. 3760, 3 p. (From *Mitteilungen f.d. Mitglieder d. Forschungsges. Blechverarbeitung,* no. 13, 1953, p. 1-3.) Henry Brutcher, Altadena, Calif.

Outline of currently used phosphate coating processes for ferrous metals; data on operating temperature, treating time and coating thicknesses produced; drawbacks resulting from sludge formation in bath; phosphate coating compared with oxalate coating; development of a process that operates at room temperature and without formation of sludge, giving a combination coating of ferrous oxalate and ferrous phosphate. (L14b)

333-L. On the Theory of Nitric-Acid Bright Pickling of Steel Sheet. G. von der Dunk. *Henry Brutcher Translation* No. 3829, 1 p. (From *Stahl und Eisen,* v. 76, no. 17, 1956, p. 1138.) Henry Brutcher, Altadena, Calif.

Critical review of literature on the bright pickling of steel in dilute nitric acid; particulars on chemical composition of residues left after pickling in various acids, with special reference to Petzold's work; preferential attack of nitric acid on grain junctions of steel. (L12g; ST, 4-3)

334-L. Black Spots in "Dry" Galvanizing. H. Bablik, F. Gotzl and E. Nell. *Henry Brutcher Translation* No. 3862, 2 p. (From *Metalloberflache,* v. 10, no. 2, 1956, p. 33-34.) Henry Brutcher, Altadena, Calif.

Previously abstracted from original. See item 395-L, 1956.
(L16; Zn)

335-L. (French.) **Work on Corrosion Undertaken by the British Iron and Steel Research Association. Pt. II. Study of the Means of Protection.** J. C. Hudson. *Corrosion et Anti-Corrosion,* v. 5, Apr. 1957, p. 119-127.

Great attention has been paid to protective coatings. Notes protection afforded against atmospheric corrosion by means of paints; analysis of anti-rust paints; influence of the thickness of the coating; influence of the conditions of application; correlation between corrosion and meteorological data such as relative humidity; protection provided by metallic coatings.
(L general, A9)

336-L. (French.) **Metallization by Spraying in the Struggle Against Corrosion.** M. Cauchetier. *Corrosion et Anti-Corrosion,* v. 5, May 1957, p. 156-159.

Metallization by the Schoop process has always given interesting results for zinc, although much less so for other metals. Reviews the principal sprayed metals currently used in France as protective coatings in corrosion control and specifies thicknesses employed; cites a number of uses for metallized parts.
(L23)

337-L. (French.) **Formation of Fish-scale in Enamel Coatings Applied on Steel Sheet. Its Relation to Certain Characteristics of the Base Metal.** Pierre Tyvaert and Roland Piva. *Fonderie,* no. 135, Apr. 1957, p. 153-160.

Experimental study comparing porcelain enamel sheets of varying thicknesses and composition. Analyzes effect of hydrogen, speed of attack, hardness and surface treatment in an attempt to determine the cause of this phenomenon. 9 ref. (L227, 9-2; ST, 4-3)

338-L. (French.) **Preparation Before Electroplating of Low-Carbon Steels.** *Galvano,* no. 243, Apr. 1957, p. 29-31.

Recommendations designed to facilitate the establishment of an appropriate cycle of cleaning operations prior to electrolytic treatment of low-carbon steels containing less than 0.35% carbon. Degreasing solutions, methods and equipment. Precautions to be taken to insure an unbroken cycle. (L12; CN)

339-L. (French.) **Choice, Control and Use of Bright Nickel Baths. (Continued.)** *Galvano,* no. 243, Apr. 1957, p. 38-41.

Methods and techniques designed to overcome occurrence of cracks

and extremely fragile bright metal deposits. (To be continued.) (L17; Ni)

340-L. (French.) **Automatic Equipment for Electroplating Plants.** Karl Gebauer. *Galvano,* no. 244, May 1957, p. 33-39.

Types of automatic systems currently in operation in France. Principles of construction and operation of automatic equipment; operating cycles; materials used in construction of tanks; transportation systems; heating systems; filters and pumps. Although automatic systems are based on American designs, modifications have been introduced in accord with European manufacturing conditions. ((L17, 1-3, 18-24)

341-L. (French.) **Choice, Control and Use of Bright Nickel Baths. (Continued.)** *Galvano,* no. 244, May 1957, p. 42-46.

Necessary equipment; points of technique involved in the cleaning of the base metal, solubility of the baths, neutralization of the formation of pits caused by the gas, treatment of passive nickel before chroming; inspection of the finished product for flaws; measurement of the thickness of deposits. 10 ref. (L17; Ni)

342-L. (French.) **Detergents and the Cleaning of Metallic Parts.** F. A. Scnitzler and A. T. Thibadeau. *Machine Moderne et Revue Mecanique,* no. 579, June 1957, p. 15-20.

Choice of cleaning product depends upon a number of factors including the method of application, nature of the metal to be cleaned, variety and amount of deposits to be removed. Methods of cleaning include submerging in tanks, electrolytic cleaning, agitation in a mixing drum, ultrasonic cleaning. Types of detergents and specific applications. (L10, L12, L13)

343-L. (French.) **Use of Galvanizing Fluxes.** A. Herz. *Metallurgie et la Construction Mecanique,* v. 89, May 1957, p. 463-464.

Essential characteristics of a galvanizing flux; its action on zinc baths; use of ammonium chloride, zinc chloride and fluorides; influence of the presence of water; saturation with oxides; use of the foams. (To be continued.) (L16; Zn, RM-q)

344-L. (French.) **Reduction of Wear and Whiskers by Electrolytic Polishing.** J. Heyes. *Metaux-Corrosion-Industries,* v. 32, Apr. 1957, p. 162-171.

Electrolytic polishing is especially useful in the case of gears in that wear and noise can be reduced by about one-seventh. Use of perchloric acetic anhydride baths. 5 ref. (L13p; T7a; ST)

345-L. (French.) **Phosphatization of Ferrous Metals.** J. Demesse. *Metaux-Corrosion-Industries,* v. 32, Apr. 1957, p. 172-175.

Different types of phosphate coatings for various purposes; zinc, manganese and iron phosphates; methods of treatment; physical and mechanical properties. 4 ref. (L14b; ST)

346-L. Deburring Improved, Cost Reduced by Blasting With Crushed Walnut Shell Pellets. Ben C. Brosheer, William D. Stampfli and W. Reece Baughn. *American Machinist,* v. 101, Apr. 22, 1957, p. 126-128.

Deburring operations on steel and die-cast aluminum parts with mechanical shell blaster units using crushed walnut shell pellets. (L10c; ST, Al, 5-11)

347-L. Coatings for Titanium. *Industrial Finishing,* v. 4, May 1957, p. 585. (CMA)

Two methods of producing surface conditions on titanium which minimize galling and seizing have been developed. An electrochemical anodizing process gives good coatings with a 5% NaOH solution at 205° F. and 50 amp. per sq. ft. for 20 min. An immersion coating process with a choice of one of three immersion baths is described. All contain fluorides and either phosphate or tetraborate. Immersion time has an important effect on the coating thickness and an optimum time is noted for each bath. The immersion coat is preferred to the anodized coat for economic and operational reasons. Both coats serve well in wire and tube drawing. (L19, L16, F26, F28; Ti, NM-h)

348-L. Painting and Graining Steel Folding Doors. Harold Lietz. *Industrial Finishing,* v. 33, May 1957, p. 20-28.

Cleaning, phosphating, drying, electrostatic painting, baking, power graining and application of final coat and bake processes in finishing of steel doors. (L26n; ST)

349-L. Cleaning and Treating Metals to Be Painted. P. C. Bardin. *Industrial Finishing,* v. 33, May 1957, p. 30-40.

Processes used in removal of soil from ferrous metals, aluminum, brass, bronze, copper and nickel and tin, include use of alkaline cleaners in multiple stage washers, phosphoric acid solution cleaning by power washing, brushing or dip tank, steam spray cleaning, degreasing with hydrocarbon solvents and solvent vapors, thermal degreasing. (To be continued.) (L12)

350-L. Chromium Plating of Gun Barrels. R. A. F. Hammond. *Institute of Metal Finishing, Bulletin,* v. 7, Spring 1957, p. 83-110.

Equipment, set-up, solution and operating conditions for electrochemical oversizing and polishing, de-smutting and chromium plating of medium-size (3 to 6-in.) gun barrels.
(L17, L13, T2m, 17-7; ST, *Cr*)

351-L. Barrel Enamelling. W. S. Field. *Institute of Metal Finishing, Bulletin,* v. 7, Spring, 1957, p. 111-113.

Principles, advantages and limitations and applications in barrel enamelling of small metal parts.
(L27)

352-L. Centrifugal Lacquering. J. G. Lemon. *Institute of Metal Finishing, Bulletin,* v. 7, Spring 1957, p. 114-118.

Features of centrifugal lacquering machines and their method of operation; suitable types of coating for metal articles such as nuts, springs, screws for which the method may be employed. (L26n, 1-2, T7)

353-L. Paint Parts First, Machine Later. A. A. Janis. *Iron Age,* v. 179, Apr. 18, 1957, p. 114-115.

Prime and finish coats of epoxy resin provide abrasive and perspiration resistant coating for parts during finish machining and in service. (L26n, G17)

354-L. Surface Treatment and Finishing of Light Metals. Pt. 13. Plated Aluminum-Tests, Corrosion, Applications. S. Wernick and R. Pinner. *Metal Finishing,* v. 55, June 1957, p. 79-84.

Specifications, applications, adhesion tests, corrosion resistance and mechanical properties. 15 ref. (L17, R general, Q general; Al)

355-L. Modern Chlorate-Accelerated Phosphating Bath. Edward Heinzelman. *Organic Finishing,* v. 18, May 1957, p. 8-11.

Mechanism of action of accelerators in phosphate coating baths. SAE 1010 cold rolled 20-gage steel sheet used for comparing phosphate coatings applied by spray or immersion containing chlorate or nitride accelerators; performance of coatings under impact, bend and corrosion rate tests. (L14b; ST, 4-3)

356-L. Electrostatic Painting in Russia. A. J. Steiger. *Organic Finishing,* v. 18, May 1957, p. 15, 16, 18.

Status of electrostatic spraying of metals in USSR; note on experimental and factory painting units, giving performance data. (L26n)

357-L. Production Painting of Metals. Royce A. Kelley. *Pacific Factory,* v. 87, Apr. 1957, p. 28-29.

Proper surface preparation and effective application of paint; procedures for centrifugal painting, electrostatic spraying, strip roller coating and flo-coating. (L26n)

358-L. Efficiency Up 30% With Electrostatic Painting of Meters. Carl M. Brehm. *Western Metals,* v. 15, May 1957, p. 52-53.

Welded meter assemblies sprayed automatically by electrostatic system eliminating paint wastage. (L26n)

359-L. Some Electrode Processes on Copper Anodes in Orthophosphoric Acid Solutions. K. F. Lorking. *Australian Aeronautical Research Laboratories,* Report A.R.L./Met. 18, Sept. 1956, 22 p.

Description and discussion of experiments showing the influence of increasing anode potential on surface finish and film formation on copper anodes in orthophosphoric acid. Theories of the mechanism of electropolishing are discussed and it is shown that modifications of these theories are indicated by the experimental observations. 26 ref. (L13p; Cu)

360-L. Vacuum-Deposited Films of Nickel-Chromium Alloy. R. H. Alderson and F. Ashworth. *British Journal of Applied Physics,* v. 8, May 1957, p. 205-210.

Preparation and properties of stable films of vacuum-deposited nickel-chromium alloy. Properties discussed include the film-alloy composition, the relationship between film thickness and resistance, the temperature coefficient of resistance, grain size in the film (electron micrographs), mechanical failure of stressed films, optical transmission as a function of film thickness,

fundamental noise and electrical breakdown under low and high frequency conditions. Graphs summarize the data and micrographs illustrate grain growth, breakdown due to stresses in the film and electrical breakdown in microwave attenuators. (L25g, N3; Ni, Cr, 14-12)

361-L. Throwing Index. A New Graphical Method for Expressing Results of Throwing-Power Measurements. Robert V. Jelinek and Hero F. David. *Electrochemical Society, Journal,* v. 104, May 1957, p. 279-281.

Method for expressing correctly the results of throwing power measurements made on plating solutions in conventional throwing power box. The metal distribution ratio (M) is plotted against the linear ratio (P) on arithmetic coordinates. The throwing power index is given by the reciprocal of the slope of this plot. (L17b)

362-L. Tin Plating From the Pyrophosphate Bath. J. Vaid and T. L. Rama Char. *Electrochemical Society, Journal,* v. 104, May 1957, p. 282-287.

Electrochemistry of solutions containing tin pyrophosphate complex; optimum operating condition for satisfactory deposition; effect of addition agents on current efficiency and quality of deposits; comparison of performance to that of stannate bath. 19 ref. (L17b; Sn)

363-L. Inclusion of Fuchsin in Bright Nickel Deposits. J. L. Dye and O. J. Klingenmaier. *Galvanic Corrosion,* v. 104, May 1957, p. 275-279.

Study of effect of fuchsin concentration and current density on amount of brightener included in the deposit during nickel plating; summarizes several chemical and physical properties of fuchsin and suggests possible mode of action as a brightener. (L17a; Ni)

364-L. Inhibitors in Acid Pickling. *Industrial Finishing,* v. 9, Mar. 1957, p. 452-454.

Investigation of 18 inhibitors used to reduce acid attack on steel during pickling and their effect on acid brittleness in 0.58% carbon steel wire pickled in sulphuric acid. (L12g; CN, 4-11)

365-L. Standardizing Surfacing Materials. W. L. Lutes and H. F. Reid. *Industry and Welding,* v. 30, June 1957, p. 73-78.

Need for standardization and classification system for surfacing materials for coating by weld deposition; note on AWS-ASTM specification and suggestions designated. 7 ref. (L24, S22)

366-L. Nature of Mechanically Polished Metal Surfaces. Deformation Produced During Abrasion of 18-8 Type Austentic Steel. L. E. Samuels and G. R. Wallwork. *Iron and Steel Institute, Journal,* v. 186, June 1957, p. 211-218.

Structure of deformed surface layer investigated by metallographic taper-sectioning technique. Depth of layer produced by various methods of abrasion was studied systematically and optimum conditions of abrasion established. Requirements of mechanical methods for polishing necessary for production of surface free from gross deformations are considered. Results are essentially in agreement with those of earlier study using specimens of 70-30 brass. 19 ref. (L10, S15; SS)

367-L. Almco Supersheen Barrel-Finishing Process. *Machinery,* v. 90, Apr. 19, 1957, p. 867-874.

Size range in barrel finishing machines, barrelling media, record keeping and numerous examples of barrel finishing techniques applied to aluminum, steel, brass, copper and other components.
(L10d, W2s, 1-2; Al, ST, Cu)

368-L. Polyamide Protective Coatings. Don E. Floyd. *Materials and Methods,* v. 45, May 1957, p. 136-144.

Properties of polyamide epoxy, polyamide phenolic and other polyamide coatings and their use for protecting metals from abrasion, heat, water, grease, acid and alkalies. (L26p)

369-L. Which Organic Coating? Howard R. Rothenberg. *Materials & Methods,* v. 45, June 1957, p. 102-106.

Working guide giving performance and cost factors for use in selecting proper organic finish for metals surfaces. (L26, 17-2, 17-3)

370-L. Automatic Control in Electroplating. J. W. Cuthbertson and J. E. Parton. *Metal Industry,* v. 90, May 3, 1957, p. 355-359.

General principles and types of control; complications and variables in automatic plating operations. (L17, 18-24)

371-L. How to Clean and Etch Aluminum. D. Gardner Foulke and O. Kendle Irgens. *Modern Metals,* v. 13, May 1957, p. 44-48.

Removal of surface contaminants from aluminum with the use of solvent cleaners, emulsion cleaners, deoxidizers or alkaline cleaners; problems in the use of acid and alkaline etchants; prevention of sludge; control of etching rate and use of conversion coatings. (L12, L14; Al)

372-L. How to Choose Heat Tolerant Coatings. *Steel,* v. 140, Apr. 22, 1957, p. 82-84.

Oxidation and corrosion resistance, thermal stability, coefficient of thermal expansion, tendency to diffuse with base metal and other properties affecting use of chromium, molybdenum, rhenium, tungsten, titanium, cobalt, tantalum and zircon and borides and silicides as protective coating for high-temperature use. (L general, R general; SGA-h, 8)

373-L. Surface Characteristics of Tinplate. W. E. Hoare. *Tin and Its Uses,* no. 39, Summer 1957, p. 9-11.

Nature and value of naturally occurring air formed on oxide films; artificial films produced by chemical or electrochemical means; oil films obtained during production of tinplate or added later to tinplated steel. (L14, L16; St, *Sn*)

374-L. Fundamentals of Barrel Finishing. Pt. 2. How to Get Started. T. W. Black. *Tool Engineer,* v. 38, May 1957, p. 113-120.

Suggestion for setting up a barrel finishing job. Includes note on protecting delicate parts, record keeping, finishing variables and number of operations. (L10d)

375-L. Survey of the Literature on the Electrodeposition of Molybdenum. T. T. Campbell and A. Jones. Bureau of Mines, Information Circular 7723, *U.S. Office of Technical Services,* PB 124152, July 1955. 8 p. (CMA)

An extensive bibliography of periodical literature and research reports relating to the electrodeposition of molybdenum. (L17; Mo, 11-15)

376-L. (English.) **Electrolytic Surface Phenomenon and Its Application in Precision Engineering.** Masao Naruse and Akira Nannichi. *Tohoku University, Technology Reports,* v. 21, no. 2, 1957, p. 63-69.

While conducting a fundamental experiment it was noticed that in electrolytic polishing process the surface of the anode which was to be polished gave, in the neighborhood of the liquid line, a polish phenomenon different from the polishing condition in the electrolyte, which we call the "electrolytic surface phenomenon". (L13p)

377-L. (French.) **Phosphatizing as an Aid to Cold Deformation of Metals, Particularly Wiredrawing.** P. Orlowski. *Pratique des Industries Mecaniques,* v. 40, Mar. 1957, p. 66-67.

Advantages of phosphate pretreatment; practical examples. (L14b, F28; NM-h)

378-L. (German.) **Anodic Oxidation of Titanium.** Horst Böhm. *Metalloberfläche,* v. 11, June 1957, p. 197-200.

Current-density-time curves, current-time curve with sudden voltage drop and corrosion tests show wear and corrosion resistance of anodically oxidized titanium. 10 ref. (L19, Q9n, R general; Ti)

379-L. (German.) **Ultrasonics in Electroplating.** Albert Roll. *Metallwaren-Industrie und Galvanotechnik,* v. 48, May 1957, p. 194-204.

An ultrasonic generator; influence of ultrasonics on electrochemical proceedings; ultrasonics and hydrogen liberation; agitator effect of ultrasonics; influence of ultrasonics on surface. 2 ref. (L17, 1-24)

380-L. (German.) **Testing of Galvanic Baths (Nickel and Chromium).** W. Garhöfer. *Metallwaren-Industrie und Galvanotechnik,* v. 48, May 1957, p. 205-206.

Determination of metal contents, metal impurities and sulphuric acid in the plating bath; details on the necessary operations. (L17a)

381-L. (German.) **Filtration in Electroplating. Pt. V. Filtering Devices.** Erich Stöcker. *Metallwaren-Industrie und Galvanotechnik,* v. 48, May 1957, p. 207-214.

In addition to listing equipment, media and filter aids available, tabulates advantageous methods of filtration for different types of baths (nickel, cadmium, manganese, etc.). 30 ref. (L17, 1-2)

382-L. (German.) **Metal Dyeing.** Rolf Hoeltgen. *Metallwaren-Industrie und Galvanotechnik,* v. 48, May 1957, p. 214-215.

Processes for dyeing iron and steel black-brown, black (Schweizer matt) and blue. (L14)

383-L. (German.) **Influence of Surface Treatment on the Mechanical Properties of Tungsten.** K. Sedalatschek and D. A. Thomas. *Planseeberichte für Pulvermetallurgie,* v. 5, Apr. 1957, p. 27-32.

Mechanical properties can be improved by removal of surface layers through electrolytic polishing. Measurement of transverse strength in-

dicates no appreciable improvement by removing greater amount of surface layer above 20 μ. Tensile and elongation tests indicate more favorable mechanical properties by greater removal of surface layer. 5 ref. (L13p, Q27a; W)

384-L. (Japanese.) **Chemical Polishing of Titanium Alloys.** S. Okamoto. *Government Mechanical Laboratory, Journal*, v. 11, May 1957, p. 84-86. (CMA)

A study of the chemical polishing of titanium alloys in sulphuric acid shows the best results are obtained when the acid is boiling, the concentration is 80-90% and the polishing time is 10-30 min. The alloys applicable are Ti-Cr-Mo, Ti-Ni, Ti-Cr, Ti-Ag, Ti-Mn, Ti-Fe, Ti-Mo, Ti-Cu, Ti-Co, and Ti-Mo-Al. (L12g; Ti)

385-L. How to Fire Aluminum Enamels. Paul A. Huppert. *Ceramic Industry,* v. 70, June 1957, p. 98-99.

Furnace types; firing cycles; time and temperature ratios for any given enamel composition; finish characteristics. (L27; Al)

386-L. Control of Corrosion With Zinc Coatings. J. L. Kimberley. *Corrosion,* v. 13, June 1957, p. 385t-391t.

Briefly outlines history of uses of metallic zinc coatings to control corrosion on steel; theory of zinc protective action, hot dip, metallizing, electrodeposition, sheradizing and painting methods of application; case histories cited to show merits and weaknesses of zinc coats. (L16, L17; Zn)

387-L. Basic Data on Mechanical Cleaning Operations in Steel Plants. Gilbert D. Dill. *Iron and Steel Engineer,* v. 34, May 1957, p. 123-131.

Brief descriptions of installations of centrifugal shot blast cleaning units for cleaning and descaling slabs and billets for inspection, used alone or in connection with acid pickling on carbon steel, high-silicon, stainless and other alloy steel strip, sheet plate and bar stock, extruded shapes, wire rod and structural steels; shot etching of mill rolls for special finishes; ingot mold conditioning. (L10c, 1-2; CN, AY, SS, 4-3, 4-5, 4-7, 5-9)

388-L. Peen Plating. G. H. Jenner and T. P. Hoar. *Metal Industry,* v. 90, Apr. 26, 1957, p. 329-331.

Abstract of paper presented at Institute of Metal Finishing, Brighton, England. Describes plating method performed in modified tumbling barrel using metal powders for coating. Metal powders include zinc, brass, cadmium, tin, lead and aluminum. (L29; Zn, Cu-n, Cd, Sn, Pb, Al, 6-18)

389-L. Bright Tin Coatings. Electrodeposition of Tin as a Bright Coating. A. M. Harper, A. Mohan and S. C. Britton. *Metal Industry,* v. 90, May 17, 1957, p. 421-423.

Bright ductile deposits of tin obtained from acid stannous sulphate to which a dispersion of wood tar in octyl sulphuric acid solution has been added. Effects of varying temperature, current density, tar content, salt content in electrolyte, sulphuric acid content on brightness, ductility and other properties of deposits. (L16, *Sn*)

390-L. Plating Plant Layout. P. Berger. *Metal Industry,* v. 90, May 31, 1957, p. 463-467.

Proposed plant layout for plating of copper, cadmium, nickel, chromium, zinc or tin on components made from steel. brass or zinc-base alloys. (L17, 18-17; ST, Cu-n, Zn; *Cu, Cd, Ni, Cr, Zn, Sn*)

391-L. Adherence of Porcelain Enamel Ground Coats. R. M. King. *Metal Products Manufacturing,* v. 14, June 1957, p. 58-59, 62.

Observations on the formation of metal dendrites at ground coat-steel interfaces. 7 ref. (L27, N12b)

392-L. Electroplating of Zinc Die Castings. Pt. 3. Ernest Horvick. *Metal Products Manufacturing,* v. 14, June 1957, p. 64-65, 90.

Operating details involved in the electroplating of rolled and die cast zinc in various basic designs and complex shapes. (L17; Zn, 5-11)

393-L. Ball Burnishing in a Barrel. *Precision Metal Molding,* v. 15, June 1957, p. 51-53.

Barrel finishing method for polishing aluminum or zinc die castings uses medium-size barrel with power-driven fixture rack and steel balls or cones as media. (L10d, W20, 1-2)

394-L. Extrusion Cladding of Zirconium to Uranium. R. J. Beaver. *U. S. Atomic Energy Commission,* CF-51-12-48. Dec. 4, 1951. 8 p. (CMA)

Preliminary work on the extrusion cladding of zirconium to uranium is reported. Five billets have been extruded, using dry-box welding or in-

duction-brazing with nickel for sealing. The extrusion temperature was 620° C. Die design and dummy blocks used are described. The most serious problem is re-entrants around the uranium core of the finished bar. Treatment of each billet is outlined. (L22, F24; Zr, U)

395-L. (French.) **Influence of Pretreatment and Degree of Surface Oxidation Before Painting on Paint Life.** Kurt F. Tragardh. *Corrosion et Anticorrosion,* v. 5, June 1957, p. 169-173.

Long-term Swedish studies have shown that the degree of surface rust on steel prior to painting and pretreatment have a direct bearing on paint life. Paint survival is considerably prolonged if pretreatment and painting are effected before steel surfaces begin to rust. (L26n)

396-L. (French.) **Protection of Metals by Butyral Polyvinyl Complexes, Phosphoric Acid and Chrome Derivatives.** P. Duval. *Corrosion et Anticorrosion,* v. 5, June 1957, p. 189-193.

Characteristics and constituents of wash primers; advantages; anticorrosive behavior; applications; extent of protection possible. (L26p, L14)

397-L. (French.) **Wetting Agents.** *Galvano,* no. 245, June 1957, p. 22-27.

Principal categories of wetting agents and their properties; use of soaps; alkyl-aryl sulphonates; cationic composition; petrol derivatives; use of cleaning solutions; wetting properties. (L12)

398-L. (French.) **Automation in Electroplating and Conveyor Systems. Pt. 2.** K. Gebauer. *Galvano,* no. 245, June 1957, p. 31-38.

Automatic equipment and controls necessary for plating procedures; construction, operation and applications of machines in electroplating process. (L17, 1-2, 18-24)

399-L. (French.) **Hot Tinning.** A. Herz. *Galvano,* no. 245, June 1957, p. 47-48.

Preparation of the metal surface; scouring and degreasing; acid solutions; fluxing; operating procedures. (L16, 1-16; *Sn*)

400-L. (French.) **Treatment of Used Pickling Baths of Ferrous Products.** J. Labergere. *Metallurgie et la Construction Mecanique,* v. 89, June 1957, p. 567-571.

Review of essential chemical equations; explanation of phenomena observed in practice. Treatment of baths by sulphating (scope of this pickling process). Advantages of sulphuric pickling as compared with hydrochloride pickling. (L12g; ST)

401-L. (French.) **Technical Comments on Some Treatments of Mechanical Parts by Hard Chrome Plating.** P. Morisset. *Métaux-Corrosion-Industries,* v. 32, May 1957, p. 208-213.

Advantages of chromium plating and its numerous applications with reference to electrolytically polished surface, piston rings, aluminum and aluminum alloys, compressor motor cylinders, brake drums and disks, textile machine parts, hydraulic turbines and musical instruments. 5 ref. (L17; *Cr,* 17-7)

402-L. (French.) **Theoretical Study of Decomposable Varnish for Protection of Combustion Chamber Walls.** H. Gelly. *Métaux-Corrosion-Industries,* v. 32, May 1957, p. 214-223.

Use of heat resistant films in rocket motors; principles underlying their action; determination of the thickness of insulating coating necessary for protection. 13 ref. (L26n; SGA-h)

403-L. (French.) **Surface Appearance of Anodized Aluminum.** Francois Flusin. *Revue de L'Aluminium,* no. 243, May 1957, p. 525-530.

Defects (pitting, stains, etc.) that have appeared in anodized aluminum and aluminum alloy sheets. Correlation between the exact conditions of the anodic treatments carried out and the defective behavior of the anodic coatings. (L19; Al, 9-21)

404-L. (German.) **Galvanizing Screws and Other Small Parts. Pt. III.** Werner Peters. *Draht,* v. 8, Mar. 1957, p. 82-83.

Calculation of layer thickness; current intensity; exposure time; electrolytic efficiency; distribution of deposit; losses; tables. (L16; T7f; ST, *Zn*)

405-L. (German.) **Application of Ion Exchange in Electroplating.** Ferdinand Furrer. *Metallwaren-Industries und Galvanotechnik,* v. 48, Feb. 1957, p. 72-81.

The application of ion exchange resins to chromic acid contaminated wastes; nickel plating; acid copper plating; recovery of zinc; cyanide containing wastes; treatment of pickling acids; and rinses. (L17, A11d)

406-L. (German.) **Fundamental Calculations in Electroplating Practice. Pt. II.** Walter Nohse. *Metallwaren-Industrie und Galvanotechnik,* v. 48, Mar. 1957, p. 98-109.

Influence of operating techniques on preparation time for articles to be electroplated; electroplating equipment; standards for personnel performance and equipment utilization. 3 ref. (L17, 1-2)

407-L. (German.) **Filtration in Electroplating. Pt. IV.** Erich Stöcker. *Metallwaren-Industrie und Galvanotechnik,* v. 48, Mar. 1957, p. 109-116.

Various commercial filter installations available to the industry. (L17, 1-2)

408-L. (German.) **Current Status of Nickel Plating.** H. C. Castell. *Metallwaren-Industrie und Galvanotechnik,* v. 48, Mar. 1957, p. 119-125.

Factors influencing mechanical properties; brightening baths, nickel sulphamate baths, zinc-nickel alloy baths; electroless nickel plating and its future. (L17, L28; Ni)

409-L. (German.) **Structure and Suitability for Pickling of Hot Rolled Strip.** *Stahl und Eisen,* v. 77, June 27, 1957, p. 845-853.

Testing method; metallographic examination of strip of different origin; pickling tests showing continuous record of the weight loss, potential and intensity of current; interpretation of the test results. (L12g; ST, 4-3)

410-L. (German.) **Manufacture of Thin Aluminum Layers Using Short Vapor Periods.** Reinhold Gerharz. *Zeitschrift für Angewandte Physik,* v. 9, Feb. 1957, p. 95-98.

Metallic vapor in a high vacuum propagated toward a vapor source in spherical, beam or cylindrical shape has been investigated. Aluminum vapor with a large diffusion pressure velocity is suitable for producing a thin condensation layer with high optical properties and mechancal adhesion in the shadow of the obstacle. 12 ref. (L25g; *Al*)

411-L. We Cut Polishing Costs 35%. A. D. Vanderbilt. *American Machinist,* v. 101, May 6, 1957, p. 120-121.

Process for polishing die cast aluminum parts involves dipping in acid and tumbling with steel burnishing balls in a soap solution. (L10b, L10d; Al, 5-11)

412-L. Electroforming Thin Films to Close Tolerances. Robert W. Hampson. *American Machinist,* v. 101, June 17, 1957, p. 121-123.

Reticles and other optical electronic components have patterns of digits and letters electroformed in matrix by plating 0.0001-in. nickel on a beryllium-copper base only 0.0015 in. thick. (L18; Ni, Be, Cu, 14-12)

413-L. Precision Barrel Finishing. Pt. 1. William E. Brandt. *Automatic Machining,* v. 18, June 1957, p. 43-46.

Action taking place in barrel; its use in precision finishing of parts; process development and the use of improved aluminum oxide chips as barreling media. (L10d)

414-L. Hot-Dip Galvanising Furnaces Heated by Forced Circulation of Exhaust Gas. Josef Kohlgruber. *Draht (English Edition)* no. 29, June 1957, p. 26-32.

Detailed description of furnaces and plants. Heat consumption data of wire, sheet, strip, tube and piece goods galvanizing plants. (L16, 1-2; *Zn*)

415-L. Electroplating Screws and Other Small Parts. Werner Peters. *Draht (English Edition),* no. 29, June 1957, p. 33-39.

Various electroplating systems in use for galvanizing screws; thickness of the deposit, quality and dimensional accuracy; sequence of preliminary operations; surface treatment; degassing, surface activation. (To be continued.) (L17, T7f; ST, *Zn*)

416-L. New Design of Shot-Blast Plant. R. Michie. *Foundry Trade Journal,* v. 102, May 30, 1957, p. 671-673.

Shot blast unit, material handling arrangements, dust collection, compressed air supply in shot blast plant for cleaning steel castings. (L10c; ST, 5-10)

417-L. Cleaning and Treating Metals to Be Painted. Pt. 2. P. C. Bardin. *Industrial Finishing,* v. 33, June 1957, p. 42-54, 58.

Condition of metal surfaces following blast cleaning, types of phosphate coating, their value and methods of application, sequence of advance in multiple stage washers, use of ultrasonic cleaning and note on anodizing of aluminum. (L10, L12, L14b, L19)

418-L. Airless Abrasive Blasting Eliminates Acid and Disposal Problems in Metal Cleaning. *Industrial Improvement,* v. 31, June 1957, p. 10-11, 16-17.

The main types of airless blasting machines are the tumble-blast type,

the table type and special ones tailor-made for specific cleaning problems. Advantages and applications of this process; comparison with the use of acids! examples of autual use. (L10c, 1-2)

419-L. Why Not Tumble Big Parts? W. E. Brandt. *Iron Age,* v. 179, June, 20, 1957, p. 91-94.

Large, heavy objects are usually tumbled by fixture technique. High chip load, low speed, ample cushioning are essential. For uniform results, barrel rotation must be reversed midway. (L10d)

420-L. Should Job Shop Platers Automate? Julian Nelkin. *Iron Age,* v. 179, May 9, 1957, p. 118-119.

Note on automated electroplating in barrels with procedures for plating cadmium. (L17, 18-24; *Cd*)

421-L. Anodic Oxidation of Aluminum, Chromium, Hafnium, Niobium, Tantalum, Titanium, Vanadium and Zirconium at Very Low Current Densities. Herman A. Johansen, George B. Adams, Jr., and Pierre Van Rysselberghe. *Journal of the Electrochemical Society,* v. 104, June 1957, p. 339-346.

Examination of the mode of formation of anodic oxidation films in the potential region below oxygen evolution. Electrolytic parameters and formation fields were evaluated from the unitary formation rates. 33 ref.
(L19; Al, Cr, Hf, Cb, Ta, Ti, V, Zr)

422-L. Effects of Various Polyvalent Metal Anion Additions to an Alkaline Magnesium Anodizing Bath. W. McNeill and R. Wick. *Journal of the Electrochemical Society,* v. 104, June 1957, p. 356-359.

Hardness, dielectric strength, and corrosion resistance were determined. Coatings from chromate, stannate, vanadate, tungstate and manganate baths were compared with those from a bath containing no polyvalent metal anion. 7 ref.
(L19; Mg)

423-L. Barrel Finishing—How and When to Use It. Lester F. Spencer. *Metal Finishing,* v. 55, May 1957, p. 48-54.

Examples of variety of steel, zinc, aluminum, brass and other parts which may be cleaned, deburred or finished by barreling; variables influencing barreling results with recommendations for their regulation; mechanical action in barrel, selection of abrasive media and barreling equipment. 7 ref.
(L10d, 1-2; ST, Zn, Al, Cu-n)

424-L. Surface Treatment and Finishing of Light Metals. Pt. 12-E. Plating on Aluminum—Hard Chromium and Non-Electrolytic Deposits. S. Wernick and R. Pinner. *Metal Finishing,* v. 55, May 1957, p. 55-59, 64.

Methods and solutions for chemical etching prior to plating; solutions for depositing chromium on aluminum, methods of surface preparation and solutions for deposition of tin, silver and nickel on aluminum. 33 ref.
(L17, L29; Al, *Cr, Sn, Ag, Ni*)

425-L. Finishing Pointers. The Water Separator in Vapor Degreasing. Max Randall. *Metal Finishing,* v. 55, May 1957, p. 60, 64.

Effect, sources and methods of removal of water present in solvent used for removing grease and oil from metal products. (L12j)

426-L. Modern Chlorate-Accelerated Phosphating Bath. Edward Heinzelman, Jr. *Metal Finishing,* v. 55, May 1957, p. 61-64.

Discusses nitrate and chlorate accelerators and their action in promoting the phosphate reaction with metal being coated; corrosive effect of accelerators and performance of phospnate coatings formed by nitrate and chlorate accelerate baths on SAE 1010 cold rolled steel. 5 ref.
(L14b; CN)

427-L. Science for Electroplates. Pt. 24. Chemical Surface Preparation. C. L. Serota. *Metal Finishing,* v. 55, May 1957, p. 65-67.

Acid pickling, acid dips and brighteners and inhibitors for reducing action of pickling solution on metal; methods of evaluating alkaline cleaners including wiping test, water-break test, spray pattern, atomizer test, fluorescent dye, radiotracer and chemical tests. (L12, 1-4)

428-L. Vitreous Enameling of Aluminum. N. G. Guy and A. H. Symonds. *Metal Finishing Journal,* v. 3, May 1957, p. 195-198.

New developments discussed at annual refresher course in vitreous enameling organized by Ferro Enamels, Ltd. (L27; Al)

429-L. Chromium Plating of Gun Barrels. R. A. F. Hammond. *Metal Finishing Journal,* v. 3, May 1957, p. 203-207.

Processes, treatment of abnormal barrels, and description of only English plant which plates large gun barrels. (L17, T2m; *Cr*)

430-L. Cleaning of Intricate Parts. H. Silman and J. E. Entwistle. *Metal Finishing Journal,* v. 3, May 1957, p. 209-212.

Ultrasonic cleaning of watch parts. (L10f)

431-L. Experiences and Problems in the Surface Treatment of Zinc and Aluminum Die Castings. H. Ruegg. *Metal Finishing Journal,* v. 3, June 1957, p. 229-240, 262.

Pretreating, painting, etching, coloring, phosphating, electroplating, chromium plating and anodizing employed by Injecta A. G. 38 ref. (L general; Zn, Al, 5-11)

432-L. Blasting With Crushed Walnut Shell. William D. Stampfli and W. Reece Baughn. *Metalworking Production,* v. 101, May 31, 1957, p. 933-935.

Pellets prepared by crushing and screening English walnut shells used in centrifugal blasting units for cleaning and deburring cast iron, steel and die-cast aluminum parts. (L10c; CI, ST, Al)

433-L. General Practices of Metal Surface Prepaint Preparation. J. H. Geyer. *Official Digest,* v. 29, June 1957, p. 533-541.

Principal chemical prepaint treatments for metals current in use. (L26n)

434-L. Removing Rust and Scale by Abrasive Cleaning. Edmund Jacobson. *Organic Finishing,* v. 18, June 1957, p. 9-11.

Procedure and saving in manhours with airless abrasive blasting. (L10c)

435-L. Glossary of Barrel Finishing Terms. *Precision Metal Molding,* v. 15, July 1957, p. 51-53.

An industry-wide cooperative project. (L10d; 11-17)

436-L. Phosphating Processes and Their Applications in Metal Finishing. D. J. Fishlock. *Product Finishing,* v. 10, June 1957, p. 65-76.

Early developments, recent progress and theory of phosphating. (L14b)

437-L. Plating Steel With Molybdenum. *Steel,* v. 140, May 20, 1957, p. 161 and 164.

System for plating molybdenum on inside surface of tubes made of AISI 4620, Hastalloy for some stainless steels; vaporized molybdenum pentachloride reduced to form coating. (L17; AY, SS, *Mo*)

438-L. Decontamination of Stainless Steel. D. O. Campbell. Oak Ridge National Laboratory. *U. S. Atomic Energy Commission,* ORNL-1826 (Del.), Mar. 2, 1955, 42 p.

The contamination on stainless steel exposed to Purex process solutions is predominantly columbium, which is also the most difficult contaminant to remove. Zirconium accounts for a few percent of the contamination, and other fission products are relatively unimportant. The most effective noncorrosive decontaminant was alkaline tartrate-peroxide. After the initial application of this reagent, its action was improved by a pretreatment of the contaminated surface with nitric acid. 54 ref. (L12; SS)

439-L. Electroplating Baths for Ultra-High-Strength Steels. Pt. 1. Use of Aliphatic Amino Acids in Cadmium Baths to Reduce Hydrogen Embrittlement. P. N. Vlannes, S. W. Strauss and B. F. Brown. Naval Research Laboratory. *U. S. Office of Technical Services,* PB 121836, Mar. 1957, 15 p. 50¢.

Electroplating high-strength steels from an ammoniacal bath containing salts of amino acids results in markedly lower hydrogen embrittlement than plating from the standard cyanide bath. Plating characteristics of aqueous cadmium baths containing six aliphatic amino acids were studied. Satisfactory plates were made from ammoniacal solutions of glycinate, beta-alaninate, n-butyrate and isobutyrate. (L17a; ST, SGB-a)

440. L. Study of Cadmium-Tin and Zinc-Tin Alloy Electrodeposits. B. Cohen. Wright Air Development Center. *U. S. Office of Technical Services,* PB 121808, Sept. 1956, 44 p. $1.25.

Cadmium-tin electrodeposits were found superior to coatings of cadmium in both corrosion resistance and embrittling effects. The alloy systems evaluated were deposited from fluoborate solutions. The cadmium-tin coating showed excellent resistance to salt spray, jet fuels, high-temperature synthetic oils and organic acid vapors. The coating had very little embrittling effect on steel as compared to cadmium plated from a cyanide solution. It was easily soldered by the same techniques used for cadmium. Zinc-tin alloy coatings were inferior in all tests to those of both cadmium and cad-

mium-tin.
(L17, R general, Cd, Sn, Zn, 8-12)

441-L. Field Tests Are Still Best for Hard Facing. D. B. Rankin. *Welding Engineer,* v. 42, June 1957, p. 52-53.

Limitations of laboratory tests and considerations when making field tests. (L24, 1-4)

442-L. Polarization Measurements for Improved Pickling Practices in Steel Industry. K. H. Brakstad. *Jernkontorets Annaler,* v. 140, 1956, p. 512-519. (*Henry Brutcher Translation,* no. 3907).

Previously abstracted from original. See item 655-L, 1956. (L12, ST)

443-L. Reactions Involved in the Impregnation of Steel Surfaces With Metals. V. A. Illarionov. *Metallovedenie i Obrazotka Metallov,* no. 3, Mar. 1957, p. 2-8. (*Henry Brutcher Translation* no. 3967).

Reactions underlying metallic surface impregnation of steel by formation of a volatile metal compound (e.g., chloride) on steel surface and chemical reaction therewith, accompanied by enrichment of steel surface with the particular metal; experiments on pack and gas aluminizing to study the mechanisms of chemical transfer of aluminum.
(L15; ST, *Al)*

444-L. (French.) **Control of Optimum Conditions for Electrolytic Polishing of Semiconductors.** I. Epelboin and M. Froment. *Journal de Physique et le Radium,* v. 18, Mar. 1957, p. 60A-61A.

Three types of baths can be used for both metals and semiconductors, but control methods are different because of relative resistivities of materials to be polished. 4 ref.
(L13p; SGA-r)

445-L. (German.) **Surface Treatment Directions for Finishing.** E. Reenebach. *Fertigungstechnik,* v. 7, Feb. 1957, p. 83-86.

A compilation of standardized finishing instructions as used by Carl Zeiss, Jena, Germany.
(L general, S22)

446-L. (German.) **Immersion (Gunbarrel Oxidizing) of Steel and Cast Iron.** H. Kohlhase. *Fertigungstechnik,* v. 7, Feb. 1957, p. 87-90.

Characteristics, historical development, sequence of operation, difficulties encountered, corrosion prevention under various conditions.
(L14a; ST, CI)

447-L. (German.) **History, Fundamentals and Application of Phosphate Coatings.** O. Borchert. *Fertigungstechnik,* v. 7, Apr. 1957, p. 146-152.

Chemical fundamentals; hot phosphate coating: phosphoric acid bath without accelerators, phosphoric acid bath with accelerators; accelerators used: nitrites, nitrates, chlorates, chromates, potassium permanganate, reducing compounds; cold phosphate coating; acceleration according to Mahu's theory; properties of phosphate coatings; phosphate coating of nonferrous metals—zinc and alloys, aluminum and alloys; technical applications. 32 ref. (L14b; Zn, Al)

448-L. (German.) **Survey of Fine Finishing.** *Fertigungstechnik,* v. 7, Apr. 1957, p. 166-170.

Fine grinding, spray lapping, electrolytic polishing, roll flattening, tolerances and surface roughness. 12 ref. (L10b, L13p, S14)

449-L. (German.) **Application of Ultrasonics.** H. Bennighoff. *Fertigungstechnik,* v. 7, May 1957, p. 225-233.

Ultrasonics has been used successfully for cleaning of metal surfaces, nondestructive testing and drilling. Description and illustration of many types of apparatus.
(L10f, S13g, G24c, 1-3)

450-L. (German.) **Electroless Nickel Plating in Practice.** L. Bosdorf. *Metallwaren-Industrie und Galvanotechnik,* v. 48, Jan. 1957, p. 1-10.

Composition of baths; the chemical reaction; temperature, pH value and deposition time of the bath; hardness of deposit; suitable metals; electroless nickel plating of plastics and glass; layer thickness testing; composition and properties of the deposit; corrosion resistance; detailed preparation for plating. 58 ref. (L28; *Ni*)

451-L. (German.) **Fundamental Calculations in Electroplating Practice. Pt. 1.** Walter Nohse. *Metallwaren-Industrie und Galvanotechnik,* v. 48, Jan. 1957, p. 17-22.

Definitions of various time factors in the operation of electroplating plants and mathematical formulas for each factor. 4 ref. (L17b)

452-L. (German.) **Filtration in Electroplating. Pt. 3.** Erich Stöcker. *Metallwaren-Industrie und Galvanotechnik,* v. 48, Jan. 1957, p. 23-27.

Filters available to the industry are of the following types: horizontal surface, vertical columns,

vertical layers, fluted "meta" filters. Commercial filters now available are discussed. (L17, 1-2)

453-L. (German.) **Influence of Raw Materials on Electroplating.** A. v. Krusenstjern. *Metallwaren-Industrie und Galvanotechnik,* v. 48, Jan. 1957, p. 28-30.

The baser the metal the greater the danger of oxide formation and porosity, inner stress and difficulties in grinding, polishing and finishing. 7 ref. (L17; RM)

454-L. (German.) **Corrosion Resistance of Glossy Zinc Deposits.** Hans-Joachim Brinkmann and Emil Knoll. *Metallwaren-Industrie und Galvanotechnik,* v. 48, Jan. 1957, p. 31-33.

Two factors are of importance in retarding corrosion in galvanizing: 1) thickness of the zinc layer and passivation treatments, and 2) length of interval between individual procedures and intensity of rinsing. (L16, R general; *Zn*)

455-L. (German.) **Cadmium as a Brightener in the Nickel Bath.** Walter Oehlerking. *Metallwaren-Industrie und Galvanotechnik,* v. 48, June 1957, p. 264-265.

Experiments on operation conditions under which cadmium addition to nickel bath results in bright nickel deposits. (L17a; *Ni, Cd*)

456-L. (German.) **Significance of pH Values in Electroplating.** Paul Lenhard. *Metallwaren-Industrie und Galvanotechnik,* v. 48, June 1957, p. 266-269, 272.

An explanation of pH values, pH measurement by colorimetry, buffer action of boric acid, application to cyanidic copper baths, brass baths, nickel baths. (L17a; *Cu, Ni*)

457-L. (German.) **Longer Tool Life and Economy Through Building up Tool Tips by Welding.** Karl Schmidt. *Schweissen und Schneiden,* v. 9, June 1957, p. 277-278.

Tool wear can be greatly reduced by applying a hard wear resistant metal to the tool tip. Materials for surfacing are tungsten carbide powder, chromium manganese alloys, cast or sintered carbides. When oxy-acetylene welding is used preheating is essential, but this is not necessary in the case of electric arc welding. Due to dispersion in the parent metal tungsten carbide applied by arc welding does not reach the same hardness after application as before. (L24, T6n; SGA-m)

458-L. (Japanese.) **Hydrogen Over-Voltage and Oxygen Over-Voltage With Nickel and Tin Alloy Electrode in Alkaline Solution.** Kumazo Sasaki and Kozo Sugiyama. *Chemical Society of Japan, Journal, Industrial Chemistry Section,* v. 60, Apr. 1957, p. 383-386.

Measurement of hydrogen and oxygen over-voltage with nickel and tin electrodes in a solution of 6*N* caustic soda. The following results were observed: (a) relationship between hydrogen over-voltage and current density; (b) minimum point of oxygen at 59% nickel; (c) minimum point of hydrogen over-voltage at 34 to 60% nickel. (L17b; *Ni, Sn*)

459-L. (Japanese.) **Hydrogen and Oxygen Over-Voltage With Nickel and Zinc Alloy Electrodes in an Electrolyte of Sulphuric Acid.** *Chemical Society of Japan, Journal, Industrial Chemistry Section,* v. 60, Apr. 1957, p. 387-392.

Hydrogen and oxygen over-voltage measurement in 20% sodium sulphate; the relationship between current density and cathode electrode potential; relationship between current efficiency and current density; relationship between hydrogen over-voltage and current density, oxygen over-voltage and current density. (L17a; Cu)

460-L. (Russian.) **Method of Coating the Surfaces of Heated Metals With Titanium.** A. N. Sysoyev and A. K. Beskrovnyy. *Byulleten Izobreteniy,* no. 1, Jan. 1957, p. 48.

Titanium coating by means of thermal decomposition of titanium iodides in a vacuum differs from other methods in that the processing is carried out by the application of high-frequency current heating. (L28, 1-19; *Ti*)

461-L. (Russian.) **Quality of Surface and Uniformity Obtained by Removal of Metal With Abrasive Fluid.** S. M. Bilik. *Stanki i Instrument,* v. 28, Jan. 1957, p. 16-20.

An abrasive fluid is applied against the surface through a jet nozzle. The fluid is made up of 1 part of abrasive and 4 of water, and is ejected by compressed air. The grade of abrasive, size of the orifice and angle of attack influence cutting power. (L10g)

462-L. (Russian.) **Copper Plating in Fluoroborate Electrolytes.** B. I. Layner and Y. A. Velichko. *Vestnik Mashinostroeniia,* v. 37, Apr. 1957, p. 60-64.

This method of copper plating permits the use of greater current density and a finer deposition of copper than is usual in sulphuric acid baths. It may be applied for plating pipes, plates, strips, and whenever heavy deposition of copper is required. Iron cannot be plated directly, for an undercoating of nickel or copper first needs to be deposited in a cyanide bath. (L17a; Cu)

463-L. (Russian.) **Use of Iron Plating in the Repair of Machine Parts.** V. P. Rebyakin and P. D. Myasnikov. *Vestnik Mashinostroeniia,* v. 37, Apr. 1957, p. 64-65.

The electrolyte is composed of iron chloride, manganese chloride and hydrochloric acid. The cohesion of the iron deposit is very firm and may reach 5-6 mm. in thickness. (L17, 18-22; *Fe*)

464-L. (Russian.) **Toughening of Low-Alloy Steel Surfaces by Boronizing.** V. D. Taran and L. P. Skugorova. *Vestnik Mashinostroeniia,* v. 37, May 1957, p. 62-65.

A crucible made of stainless steel is filled with borax. After melting the borax the electrodes are introduced. The anode is carbon and the cathode is the work piece itself. As a result of electrolysis, elementary boron is liberated which immediately diffuses in the metallic surface as iron boride. The thickness of the borated surface depends on the length and temperature of the process. 6 ref. (L15; AY, *B*)

465-L. Precision Barrel Finishing. Pt. 3. William E. Brandt. *Automatic Machining,* v. 18, Aug. 1957, p. 48-52.

Types of tumbling barrel media; abrasive cutting, nonabrasive cutting, burnishing and coloring, washing and rust prevention, descaling of ferrous metals and bleaching of nonferrous metals, metals and jobs for which compounds are best suited. (L10d)

466-L. Wire Lacquering Machines. Friedmund Rub. *Draht (English Edition),* no. 28, Apr. 1957, p. 32-34.

Equipment for even and speedy application of lacquers to copper and nickel-chromium wires. (L26n, 1-2)

467-L. Kinetic Studies on Formation of Black-Oxide Coatings on Mild Steel in Alkaline Nitrite Solutions. Ray M. Hurd and Norman Hackerman. *Electrochemical Society, Journal,* v. 104, Aug. 1957, p. 482-485.

Studies made over range from 130 to 150° C. Over-all mechanism for formation of black oxide is proposed. 4 ref. (L14a; ST)

468-L. Study of Cathode Potentials in Aqueous Tungstate Solutions. D. R. Markwell and M. L. Holt. *Electrochemical Society, Journal,* v. 104, Aug. 1957, p. 488-493.

Cathode potential measurements used to obtain information about the cathode process that results in electrodeposition of tungsten alloys. 15 ref. (L25h; W)

469-L. A Guide to Stainless Steel Finishing. W. E. McFee. *Grinding and Finishing,* June 1957, p. 39-44.

Types of flexible grinding and polishing wheels and belts and basic rules for applying for surface finishing. Instructions for heading wheels in the shop. (L10b; SS)

470-L. Vapor Degreasing Cleans Metal Parts for Painting. *Industrial Finishing,* v. 32, July 1957, p. 42-46.

Advantages of process; equipment used. (L12j, 1-2)

471-L. Aluminium Anodising Based on American Experience. *Industrial Finishing,* v. 9, July 1957, p. 692-695.

Dependence of coating weight and thickness upon oxidation time and current; effect of alloy composition on coating; utilization of anodized aluminum in automobile trim. (L19; Al)

472-L. Application of Vitreous Enamels on Aluminium. A. H. Symonds. *Industrial Finishing,* v. 9, July 1957, p. 702-703.

Suitable alloy compositions for application of vitreous enamels to aluminum in the form of sheet, extruded sections or cast material; enamel application method and variations in enamel weight. (L27; Al)

473-L. Surfacing With Stainless Prevents Pit Corrosion. J. A. Rau. *Iron Age,* v. 180, July 18, 1957, p. 120-121.

Shafts of extrusion presses receive protective coating of stainless steel deposited with automatic submerged arc welding. (L24, R2j; SS)

474-L. Milling Aluminium Enamels. N. G. Guy. *Light Metals,* v. 20, June 1957, p. 180-181.

Recommended mill additions are sodium metasilicate and boric acid. Cleaning and pretreatment of aluminum prior to enameling; storage of aluminum enamels. (L27; Al)

475-L. Firing Aluminium Enamels. T. B. Vaughan. *Light Metals,* v. 20, June 1957, p. 181-183.

Requirements include correct temperature and time in furnace, correct support of and uniform heating of ware, dust-free atmosphere. Factors influencing firing time and temperature. Furnaces used. (L27; Al)

476-L. Application of Vitreous Enamels on Aluminum. A. H. Symonds. *Light Metals,* v. 20, June 1957, p. 183-184.

Compositions of aluminum sheet and castings suitable for enameling. Spraying, dipping, drying, brushing and tests for finished product. (L27; Al)

477-L. Vitreous Finish for Aluminium. *Light Metals,* v. 20, June 1957, p. 180-184.

Three papers presented at Ferro Enamels, Ltd., refresher course. Papers are separately abstracted. (L27; Al)

478-L. Vapor Blasting Deburrs and Blends Machined Surfaces. Ray Furgeson and John E. Eggum. *Machinery,* v. 63, July 1957, p. 180-183.

Continuous process of deburring wing panels by spraying with mixture of water, abrasive particles and compressed air. (L10c)

479-L. Electroplating Is an Important Step in the Construction of a Man-Made Satellite. George W. Grupp. *Metal Finishing,* v. 55, July 1957, p. 40-44.

Sequence of operation used in gold plating space satellite. (L17; *Au*)

480-L. What Size Filter? Gunnar Gabrielson. *Metal Finishing,* v. 55, July 1957, p. 50-51.

Mathematical analysis of system for continuous removal of impurities from electroplating solutions. (L17, 1-2, A8b)

481-L. Finishing Pointers. Life of Alkaline Cleaning Baths. J. B. Mohler. *Metal Finishing,* v. 55, July 1957, p. 57, 67.

Note on control of alkaline cleaning bath composition and estimation of bath life. (L12k)

482-L. Efficient Cleaning Methods. L. F. Spencer. *Metal Industry,* v. 91, July 12, 1957, p. 29-32.

Recommendations on selection of cleaning materials and cleaning equipment for preparing metal surfaces for finishing. (L10, L12)

483-L. Finishing of Zinc Alloy Die-Castings. J. Edwards. *Metal Industry,* v. 90, June 28, 1957, p. 547-550.

Explanation and measures for elimination of defects such as process blistering and service blistering which occur in copper, nickel and chromium coatings electrodeposited on zinc die castings; control of coating thickness and properties of electrodeposits; other coating methods. 32 ref. (L17, L general; Zn, 5-11, 9-21)

484-L. Deburring Gets Down to Millionths of an Inch. *Metalworking,* v. 19, Aug. 1957, p. 3-5.

Aluminum, stainless steel and copper alloys parts for inertial guidance systems are deburred and finished by precision barrelling and electropolishing. (L10d, L13p; Al, SS, Cu)

485-L. Nickel Will Stretch. Cleveland F. Nixon. *Plating,* v. 44, July 1957, p. 757-762.

Methods at General Motors to conserve nickel in plating operations. Conclusions based on acetic acid spray test results. (L17; *Ni*)

486-L. Phosphating Processes and Their Applications in Metal Finishing. Pt. 2. Choice of Plant. D. J. Fishlock. *Product Finishing,* v. 10, July 1957, p. 73-85.

Metal cleaning practice and layout of plant for phosphating operations. 11 ref. (L14b, W10a, 18-17)

487-L. "Plasteel." Description of the British Iron and Steel Research Association Plant and Process for Producing P.V.C.-Coated Steel Strip. W. Bullough and T. A. Canning. *Sheet Metal Industries,* v. 34, June 1957, p. 431-433.

Method for bonding thin film of polyvinyl chloride to flat steel sheet or strip. Laminate remains bonded following sharp bend for drawing operations. (L26p; ST)

488-L. New Process for the Production of Plastic-Coated Sheet. "Mechanical Bond" Eliminates Adhesives. *Sheet Metal Industries,* v. 34, July 1957, p. 526-527.

Mechanical bond obtained by perforating aluminum or steel sheet with small closely adjacent holes and forcing plastic material through holes to anchor plastic. (L26p)

489-L. Cheaper Cleaning. Mechanical Blast Descaling Cuts Cost for Strip and Sheet Processes. E. F. Anderson. *Steel Processing and Conversion,* v. 43, July 1957, p. 396-397.

Advantages of descaling steel strip by centrifugal blasting with steel shot. (L10c; ST, 4-3)

490-L. Protection of Uranium: Vapor-Deposited Coatings. I. E. Camp-

bell, E. M. Sherwood, C. F. Powell and R. P. Jones. Battelle Memorial Institute. *U. S. Atomic Energy Commission*, BMI-887, Nov. 24, 1953, 19 p.

The most satisfactory vapor-deposited coatings on uranium were obtained by a displacement-diffusion process similar to pack chromizing, employing the vapors of the lower zirconium iodides. (L25; U)

491-L. Degreasing and Pickling of Uranium Chips. B. G. Ryle, R. W. Vest and J. F. Blum. National Lead Co. of Ohio. *U. S. Atomic Energy Commission*, FMPC-497, Dec. 1, 1954, 18 p.

The relative efficiency of detergents and an organic solvent (trichloroethylene) as degreasing agents investigated. The effects of temperature, nitric acid concentration and immersion time studied to determine conditions necessary to obtain the most complete oxide removal with the minimum loss of uranuim metal. (L12; U)

492-L. (Japanese.) **Surface Treatment of Metals.** *Electrochemical Society of Japan, Journal*, v. 24, Dec. 1956, p. 630-635.

Various methods for coating nickel, copper, cadmium, zinc, iron and noble metals; mechanism of anode treatment and anodic oxidation. 102 ref. (L general, L19; Ni, Cu, Cd, Zn, Fe, EG-c)

493-L. (Russian.) **Increasing Polishing Efficiency.** D. V. Charnko and L. V. Khudobin. *Stanki i Instrument*, v. 28, Apr. 1957, p. 11-13.

Instruments measuring the pressure on the working surface are recommended. Detailed description and diagrams of the arrangement for measuring the force applied to the polished surface. (L10b)

494-L. Production of Thin Layers of Plutonium, Americium and Curium by Electrodeposition. G. N. Yakovlev, P. M. Chulkov, V. B. Dedov, V. N. Kosyakov and Yu. P. Sobolev. *Soviet Journal of Atomic Energy*, no. 5, 1956, p. 813-815. (Translated by Consultants Bureau, Inc.)

The elements were deposited in the form of hydroxides from neutral and weakly acidic alcoholic acetone solutions of the chlorides. (L17; Pu, Am, Cu)

495-L. Titanium Coating and Its Application. Pt. 2. T. Yamaguchi and T. Takei. *Tokyo, Scientific Research Institute, Journal*, v. 51, June 1957, p. 75-81. (CMA)

Titanium alloy cementation coatings were studied at normal and high temperatures. They are almost as resistant to aqueous media as titanium, although high temperatures decrease the resistance. The coating compositions prepared were TiAl, Ti + Al (powder), $TiAl_3$, TiSi, TiNi, and TiNi + TiO_2. Scaling resistance was studied for sulphur-containing atmospheres. The Ti-Al mixture gave the best results. (L15, R general, 2-12; Ti, 8-24)

496-L. Heat Resistant Paints for Rocket Launchers. T. Rice. Rock Island Arsenal Laboratory, *U. S. Office of Technical Services*, PB 121736, Sept. 1956, 12 p. 50¢.

A zinc dust pigmented dibutyl titanate resin-type paint displayed superior resistance to a short blast of flame similar to that produced during rocket firing. Resistance of an aluminum pigmented silicone resin-type was also excellent, but was rated somewhat lower than that of the zinc DBT composition. (L26n, 2-12)

497-L. Electrodeposition of Titanium on Base Metals. M. E. Sibert. U. S. Air Force, Wright Air Development Center, Technical Report 53-503. *U. S. Office of Technical Services*, PB 121958, Dec. 1953, 34 p. (CMA)

The electrolytic cladding of base metals with titanium was achieved through the use of fused salt bath under inert gas and high temperatures (850° C.). Clads of the 0.003 in. were obtained with a diffusion-type bond. Thick layers may be produced by repetitive electrolysis. The usual bath composition contained K_2TiF_6. (L17; *Ti*)

498-L. Electrodeposited Foils for Use as Magnetic Materials in Communication Technology. F. Khol. *Slaboproudy Obzor*, v. 16, no. 6, 1955, p. 323-327. (*Henry Brutcher Translation* no. 3974.)

Production of foils of pure iron or iron-nickel compositions by electrolytic deposition rather than by cold rolling; properties required of such foils; production process suggested for iron foil; deposition conditions for the continuous production of 50% Fe, 50% Ni strip for toroidal windings; proposed layout of plant; magnetic properties as function of heat treatment of foils. (L18; Fe, Ni, SGA-n, 4-6)

499-L. (French.) **Preparation for Electroplating of High-Carbon Steels.** *Galvano*, no. 246, July 1957, p. 19-22.

Operational cycle is aimed at the reduction of hydrogen embrittlement and obtaining maximum adherence of the electrodeposited metal. Degreasing, mechanical treatment, scouring, anodic acid treatment, heat treatment after electroplating. (L general, L17)

500-L. (French.) **Electrodeposition of Rhodium.** *Galvano,* no. 246, July 1957, p. 26-28.

Use of rhodium as a hardening agent for platinum; methods of purification and application; types of rhodium solutions; effects of metallic impurities in rhodium solutions. (To be continued.) (L17; Rh)

501-L. (French.) **Automatic Galvanizing of Propellers.** *Galvano,* no. 246, July 1957, p. 29-32.

Description of new zinc plating installation at Hamilton Standard Division of United Aircraft Corp. (L16; *Zn*)

502-L. (French.) **Anodic Film Protection of Aluminum and Aluminum Alloys.** W. Wiederholt. *Revue de L'Aluminium,* no. 245, July-Aug. 1957, p. 721-733.

Necessity for control of thickness and density of oxide coatings; measurement of coating thickness by microscope, chemical means and by the use of the isometer; colorimetric determination; permeability and efficiency of the various sealing processes; corrosion tests enabling accurate quality control of oxide coatings insuring efficient protection in normal atmospheres. 9 ref. (L19, S14; Al)

503-L. (French.) **Surface Treatment of Aluminum and Aluminum Alloys. Coating by Means of Paints and Varnishes. Pt. 1. Protective Varnishing.** Jean-Jacques Meynis de Paulin. *Revue de L'Aluminium,* no. 245, July-Aug. 1957, p. 757-765.

Aluminum can most profitably be varnished to retain its fine aspect. Satisfactory results are obtained with furnace-glazed synthetic varnish baked at high temperature and more especially with certain methacrylic varnishes. (L26n; Al)

504-L. (German.) **Formation and Growth of Protective Layers on the Surface of Aluminum.** Hans Ginsberg. *Zeitschrift für Metallkunde,* v. 48, June 1957, p. 357-360.

Current-voltage curves are measured during the formation of the eloxal layers in slightly dissolving electrolytes after different surface treatments. The effect of irradiation before and after sealing of the layer is reported, and the results of microchemical investigations of the layers are discussed. (L14, 2-17; Al)

505-L. (German.) **Burnishing, a Method for Improving the Surface Finish Without Removal of Metal.** Helmut König. *Zeitschrift für Metallkunde,* v. 48, June 1957, p. 336-370.

The practical application of a smooth rolling burnishing technique is described by examples and with reference to deformation processes in the surface. Smooth rolling changes surface hardness and internal stresses as well as surface roughness, so that there are limits to its applicability. Economic estimates show the advantages of this technique. (L10b)

506-L. (Italian.) **High-Vacuum Metallizing of Plastic Materials.** G. Zanini. *Materie Plastiche,* no. 5, May 1957, p. 381-383.

Aluminum, copper, steel and gold are used for coating jewelry and other objects where attractive appearance is significant. Surface finish of article to be treated must be as perfect and clean as possible, as a grain of dust or a fingerprint is greatly magnified in the metal coating. (L23, 1-23; *Al, Cu, ST, Au*)

507-L. (Japanese.) **Effect of Temperature on the Passivity of Nickel.** Go Okamoto, Haruo Kobayashi, Norio Sato and Masaichi Nagayama. *Electrochemical Society of Japan, Journal,* v. 25, Apr. 1957, p. 199-203.

Determination of passivity of nickel by potentiostatic method; effect of temperature, current density and frequency on the impedance of passive nickel in sulphuric acid. 21 ref. (L17; *Ni*)

508-L. (Russian.) **Depth of Sulphur-Enriched Layer of Steel and Cast Iron on Sulphidizing.** G. V. Karpenko, A. N. Tynni and Yu. I. Babei. *Vestnik Mashinostroenia,* v. 37, Feb. 1957, p. 61-62. (*Henry Brutcher Translation* no. 3932.)

Experiments using S^{35} isotope. Depth of the layer is estimated as 0.015-0.016 mm. for the steel and 0.034 mm. for the cast iron. 4 ref. (L15; ST, CI, *S*)

509-L. Wettability in Enamel-Metal Systems. Robert M. King and Ralph L. Cook. *American Ceramic Society Bulletin,* v. 36, Aug. 1957, p. 293-296.

Determination of wettability of enamel-grade iron by molten enamel

under various conditions of oxidation in wet and dry atmospheres. 10 ref. (L27; CI)

510-L. Hard Nickel Plating Makes Molds and Saves Molds. Charles Emerson. *American Machinist,* v. 101, July 1, 1957, p. 85-87.

Accurate built-up molds for plastic parts made by silver spraying the master part, then plating on hard nickel and copper. (L17; *Ni,* NM-d)

511-L. Permanent Forms of Metal Protection. Stanley Wright. *Cleaning and Maintenance,* v. 5, Aug. 1957, p. 39-42.

Metallic, organic and phosphatic coatings. (L general)

512-L. Annual Conference, Institute of Metal Finishing. *Electroplating and Metal Finishing,* v. 10, May 1957, p. 136-151.

Comprehensive abstracts of papers presented at conference. Mechanism of leveling in electrodeposition; influence of periodic reverse of current upon surface roughness; properties of coatings formed by chromic acid anodizing; peen plating; electrodeposition of tin as bright coating; cathodic polarization of nickel; continuous measurement of stress in electrodeposits; effect of chromium and nickel plating on fatigue properties; adhesion; spray booth design and control of spraying; cleaning intricate parts. (L general)

513-L. Problems of Spray Suppression in Chromium Plating. P. J. Ramsden. *Electroplating and Metal Finishing,* v. 10, May 1957, p. 152-155.

Application of surface active agents to chromium plating solutions to reduce mist and spray formation. (L17; *Cr*)

514-L. Bright Nickel Plating on Cast Iron. E. Alary. *Electroplating and Metal Finishing,* v. 10, July 1957, p. 227-230.

Problem and final procedure developed in plating copper on sand castings of iron followed by polishing and bright nickel plating. (L17; CI, *Cu, Ni*)

515-L. Systems for Finishing Magnesium. *Industrial Finishing,* v. 9, Aug. 1957, p. 736-742.

Cleaning, acid pickling and treating steps; surface stability and corrosion problems. (L general; Mg)

516-L. Plating and Painting at London Airport. *Industrial Finishing,* v. 9, Aug. 1957, p. 755-756.

Processes and equipment used by the British Overseas Airways Corp. in maintaining their aircraft. (L17, L26n; T24, 18-21)

517-L. Zinc and Phosphate Coatings. N. E. Hays. *Industrial Finishing,* v. 9, Aug. 1957, p. 757-759.

Relative merits of zinc coated and phosphated sheets. Comparative advantages of buying mill-phosphatized sheets and installing phosphate treating equipment in the manufacturing plant. (L14b, L16; ST, *Zn*)

518-L. Effect of Silicon in a Low-Alloy Steel on the Adhesion of Heavy Nickel Plating. J. J. Dale and H. K. Lutwak. *Institute of Metal Finishing, Bulletin,* v. 7, no. 2, Summer 1957, p. 133-138.

Evidence obtained by treating anodically etched steel with sodium hydroxide indicates presence of film of silicic acid which permits proper adhesion of subsequent nickel deposits. Silicic film formed on silicon-containing alloy steel following anodic etching in sulphuric acid. 16 ref. (L17, L19n; AY, *Ni*)

519-L. Two Tanks Do Work of Ten in Surface Treatment. C. J. Riddle. *Iron Age,* v. 180, Aug. 22, 1957, p. 104-105.

Cycling of solutions cuts number of tanks needed for anodizing aluminum aircraft components from ten to two. (L19, W3g, 1-2; Al)

520-L. Washing-Machine Tubs Slip-Coated Automatically. John H. Bauer. *Machinery,* v. 64, Sept. 1957, p. 178-179.

Ground coat of slip is obtained mechanically at the Whirlpool-Seeger Corp. by rotating tubs slowly on a spider and shaking them intermittently to remove excess slip. (L27)

521-L. Thick Oxide Films on Aluminium Alloys. J. M. Kape. *Metal Industry,* v. 91, July 26, 1957, p. 63-65.

Abrasion resistance of oxide coating produced on commercially pure aluminum sheet anodized using a constant wattage power input with sulphuric acid electrolyte; effects of varying electrolyte concentration, wattage and temperature. (To be continued.) (L19n; Al)

522-L. Thick Oxide Films on Aluminium Alloys. J. M. Kape. *Metal Industry,* v. 91, Aug. 2, 1957, p. 90-92.

Effect of alloy compositions and pretreatment on thickness, abrasion resistance and co'or characteristics

of anodized aluminum coatings produced in sulphuric acid electrolyte under direct current with constant wattage. (To be continued.) (L19n; Al)

523-L. Steel Grit Abrasive Advantageous in Blast Cleaning Heat Treated Parts. Eugene F. Anderson. *Metal Treating,* v. 8, July-Aug. 1957, p. 8, 42.

Desirability of steel grit abrasive compared to chilled iron abrasive for centrifugal blasting of hardened steel part in tumble-blast units. (L10c, W2a, 17-7; ST)

524-L. Physical Properties of Electrodeposited Metals. T. E. Such. *Metallurgia,* v. 56, Aug. 1957, p. 61-66.

The wide variations in physical properties; tensile strength, ductility, hardness and internal stress that can be obtained in electrodeposited metals. Description of way in which these metals and articles plated with them are affected by changes in these properties, and methods for their determination. 24 ref. (To be continued.) (L17c, Q general; 8-12)

525-L. Protecting Sheet-Steel Products. A. N. Laubscher and C. P. Larrabee. *Paint and Varnish Production,* v. 47, Aug. 1957, p. 35-37, 89.

New approach to applying protective coating on sheet steel prior to fabrication reduces deterioration. 6 ref. (L26n; ST, 4-3)

526-L. Study of Cadmium-Tin and Zinc-Tin Alloy Electrodeposits. Bennie Cohen. *Plating,* v. 44, Sept. 1957, p. 963-968.

Alloy electrodeposits provide superior coatings to either zinc or cadmium deposits. Procedures for plating S.A.E. 1020 steel with cadmium-tin and zinc-tin electrodeposits; electroplated steel specimens evaluated by salt spray and acid tests. 7 ref. (L17, *Cd, Sn, Zn,* ST)

527-L. Spectrophotometric Determination of Nickel in Bright Cadmium and Bright Gold Plating Solutions. Norman F. Doherty. *Plating,* v. 44, Sept. 1957, p. 971-974.

New Spectronic 20 colorimeter at the Cannon Electric Co., Los Angeles, maintains correct brightener content in the manufacture of plugs and connectors. (L17, S11k; Ni, Cd, Au)

528-L. Electrochemistry and the Plater. Pt. 1. Fred G. Brune. *Products Finishing,* v. 21, Aug. 1957, p. 44-48.

Elementary electrochemistry of interest to the electroplater. (L17)

529-L. Some Problems of the Production of Sheet-Metal Components in Relation to Surface Quality and Finishing Processes. D. H. Lloyd. *Sheet Metal Industries,* v. 34, Aug. 1957, p. 577-584.

Effects on finishing processes of large grain size, stretcher strains, galling, badly designed folded joints, poor lubrication of press tools. (L general, G general, 17-2; 4-3)

530-L. Barrel Finishing Made Simpler. Philip Kaftol. *Steel,* v. 141, Sept. 9, 1957, p. 108-109.

Chart indicating metal and nature of operation to be performed and requisite tumbling media, compound, concentration of compound and desired water level. (L10d)

531-L. Tin Bronze Alloys as a Decorative Plating. *Tin,* May 1957, p. 103-104.

Use of tin-copper alloys containing 7 to 20% tin as a corrosion resistant and decorative electroplate has achieved considerable popularity. (L17, 17-7; *Sn, Cu,* 8-12)

532-L. Stress-Free Plating Salvages Valuable Jet Engine Parts. Edward Calderon. *Western Metals,* v. 15, Aug. 1957, p. 58-59.

Metal build-up to bring undersized production parts or worn out machine tools up to correct size was obtained by stress-free, high-tensile nickel deposits from a nickel sulphamate bath. (L17; Ni)

533-L. (French.) **Five Years of Observations on "Sulfinuzation".** Y. de Villemeur. *Metaux-Corrosion-Industries,* v. 32, June 1957, p. 249-259.

"Sulf-Inuz" process (treatment in hot bath at 570° C. designed to incorporate sulphur in surface area of metal, in presence of melted cyanide) greatly improves friction characteristics without need for prior machining to obtain perfect regularity of geometrical surfaces in contact. Analysis of interesting structures which explain the unusual properties conferred by this treatment on metal surfaces. (L15; *S*)

534-L. (French.) **Experimentation With Small-Scale Models of Continuous Installations for Electrolytic Treatment of Surface of Sheet Steel.** Louis Ferrand. *Societe des Ingenieurs Civils de France, Memoires,* v. 110, Mar-Apr. 1957, p. 85-108.

Equipment described; results of experiments with nickel, chromium,

zinc and application of results to actual production. Suggests use of scale models for research purposes in other metallurgical areas. 29 ref. (L17, 1-2, 17-6; ST, *Ni, Cr, Zn)*

535-L. (Italian.) **Influence of Manganese on Plating Alloys for Use on Ergalplat 55 and 65.** A. Prati, A. Gragnani and D. Gualandi. *Allumi-nio,* v. 26, July-Aug. 1957, p. 301-314.

Experimental results showed that a 1% Zn, 1% Mn aluminum alloy gives better results than a 1% Zn alloy for plating Ergal-type alloys. Addition of manganese increases hardness of coating, retards diffusion of the alloying elements from core, and improves corrosion resistance of plated alloy. 8 ref. (L17; 2-10; Al, *Mn)*

536-L. (Italian.) **Sherardizing: Influence of Part Shape on Depth of Sherardized Coatings and on Their Corrosion Resistance.** L. Matteoli and F. Barigozzi. *Metallurgia Italiana,* v. 49, May 1957, p. 355-362.

Conditions were defined experimentally for obtaining coatings of adequate thickness and protective power in cases of hollow and tubular parts, especially where cavities or recesses impede circulation and there is danger that mixture will sinter. Accelerated corrosion tests were made on treated samples. 14 ref. (L16, R11; *Zn)*

537-L. Vitreous Enamelling on Steel and Cast Iron. J. W. G. Pedder. *Corrosion Prevention and Control,* v. 4, Aug. 1957, p. 37-40.

Enamel composition and surface preparation for applying enamel to steel and cast iron; uses of enamel products in industry, household goods and construction materials. (L27; ST, CI, 17-7)

538-L. The Protection of Threaded Parts by Electroplating. E. A. Ollard. *Corrosion Prevention and Control,* v. 4, Aug. 1957, p. 41-47.

Control problems and the methods used for electroplating steel and brass screws with zinc, cadmium, tin or nickel and chromium. (L17, T7f, 17-7; ST, Cu-n, *Zn, Cd, Sn, ni, Cr)*

539-L. Hot Dip Galvanizing. *Corrosion Prevention and Control,* v. 4, Aug. 1957, p. 44-46.

Galvanizing process; protective action of zinc on steel; characteristics of galvanized coating and application of galvanized products. (L16; ST, *Zn)*

540-L. Corrosion Prevention by Cadimum Plating. P. F. Norrish. *Corrosion Prevention and Control,* v. 4, Aug. 1957, p. 51-53.

Protective action of cadmium coatings on steel, comparison of cadmium and zinc coatings; electroplating process and uses of cadmium-plated products. (L17; ST, *Cd)*

541-L. New U. S. Plating Thickness Testers. *Electroplating and Metal Finishing,* v. 10, Aug. 1957, p. 249-250.

Instruments for gaging plating thickness include dermitron, measuring magnitude of eddy currents; phase angle thickness gage, depending on phase differences; and wave guide plating quality indicator, measuring conductance of coating. (L17c, S14, 1-2)

542-L. Electrodeposition of Chromium-Molybdenum Alloys. S. C. Shome. *Indian Chemical Society, Journal,* v. 34, May 1957, p. 399-403. (CMA)

Chromium-rich alloys of molybdenum have been plated from solutions prepared by dissolving molybdic acid in the standard chromium plating solution. The dull deposits become bright on polishing. The highest amount of molybdenum achieved was 1.7%. Plating compositions, temperatures and current density conditions are tabulated. (L17; *Cr, Mo)*

543-L. Selecting Mechanical Finishes for Aluminum. R. V. Vanden Berg. *Materials in Design Engineering,* v. 46, Aug. 1957, p. 102-106.

Types of surface obtainable by mechanical finishes; methods of finishing, advantages and limitations. (L10; Al)

544-L. Selecting Mechanical Finishes for Stainless Steel. Richard E. Paret. *Materials in Design Engineering,* v. 46, Sept. 1957, p. 110-114.

Types of mill finish, methods of obtaining, surface appearance, applications; recommended operations for obtaining finishes equivalent to high mill polishes. (L10; SS)

545-L. Conversion Coatings for Metals. Robert J. Fabian. *Materials in Design Engineering,* v. 46, Aug. 1957, p. 121-136.

Phosphate, chromate, anodic, oxide and other coatings; metals that can be coated and types of coating produced; use of coating as decoration, aid to cold forming or improvement in paint bonding, corrosion or wear resistance. (L14)

546-L. Electroplating on Titanium Alloys. Leo Missel. *Metal Finishing,* v. 55, Sept. 1957, p. 46-54. (CMA)

Adherent electrodeposits of chromium, comparable to those on steel, were obtained on Ti-4Al-4Mn, Ti-6Al-4V and Ti-5Cr-3Al. Activation treatments for different alloys vary, most involving immersion in an HNO_3-HF mixture. Steel ball indentation tests of the electrodeposits were conducted. (L17; Ti, *Cr*)

547-L. Density and Porosity of Anodic Coatings on Aluminum. Ralph B. Mason. *Metal Finishing,* v. 55, Aug. 1957, p. 55-57.

Real density and percentage porosity of unsealed and water-sealed anodic coatings on 1100-H16 aluminum determined by weighing in toluene; variation in density and porosity with anodizing time, electrolyte and temperature. 15 ref. (L19, P10a, P10m; Al)

548-L. Barrel Finishing. Arthur S. Kohler. *Metal Finishing,* v. 55, Aug. 1957, p. 58-64.

Barrel finishing principles and action taking place during barreling; definitions of words connected with barrel finishing; work classification and types of barrels including barrels of closed horizontal type submerged multi-compartmental barrels, fixtured barrels, oblique and other types. (To be continued.) (L10d, 1-2)

549-L. Application of Ultrasonics in the Electroplating Industry. T. J. Bulat. *Metal Finishing,* v. 55, Aug. 1957, p. 65-67.

Production of ultrasonic vibration and application to the activation of bath in electroplating processes; utilization of ultrasonic cleaning prior to plating. (L17, 1-24, L10f)

550-L. Some Problems in the Finishing of Zinc-Alloy Die-Castings. J. Edwards. *Metal Finishing Journal,* v. 3, Aug. 1957, p. 311-316.

Literature review covers defects and common difficulties encountered in plating zinc alloy die castings, such as process blistering, service blistering and methods of insuring acceptable plating. Properties of electrodeposits and methods in measurement and control of coating thickness; alternative methods of finishing zinc die castings. 32 ref. (L17; Zn, 5-11; 10-4)

551-L. An Examination of Concentration Differences in Lead-Fluoborate Plating Baths. Gunnar Gabrielson. *Metal Finishing Journal,* v. 3, Aug. 1957, p. 335-337.

Experimental determination of differences in concentration with level in lead fluoborate plating bath. 7 ref. (L17a)

552-L. Thick Oxide Films on Aluminium Alloys. J. M. Kape. *Metal Industry,* v. 91, Aug. 9, 1957, p. 109-111.

Effect of glycerol, ethylene glycol or triethanolamine additions to electrolyte on the thickness and abrasion resistance of coatings produced in sulphuric acid electrolyte with constant power input; properties of coatings produced by electrolytes composed of various mixtures of sulphuric and oxalic acids. (To be continued.) (L19; Al)

553-L. Thick Oxide Films on Aluminium Alloys. J. M. Kape. *Metal Industry,* v. 91, Aug. 23, 1957, p. 148-150.

Porosity of anodic films produced on Hiduminium 33 and 44 in oxalic, malonic, sulphuric or mixed acid; measured by rate of transpiration of vapor through film and by absorption of organic matter by film. (To be continued.) (L19; Al)

554-L. Thick Oxide Films on Aluminium Alloys. J. M. Kape. *Metal Industry,* v. 91, Aug. 30, 1957, p. 171-172.

Measurement was made of the indication of porosity change by the rate of change of voltage during anodic treatment. The higher the current density during anodizing the more compact the film produced. (To be continued.) (L19; Al)

555-L. Operating Experiences With Chromic Acid Recovery Equipment. Clifford L. Gough and Charles G. Bueltman. *Plating,* v. 44, Aug. 1957, p. 879-883.

Problems and experiences with ion exchange units for the recovery of chromic acid from rinse water. (L17, A11d; *Cr*)

556-L. Mechanized Finishing. *Precision Metal Molding,* v. 15, Sept. 1957, p. 75-91.

Finishing techniques applied to die castings; automatic spray painting; automatic buffing and polishing; automatic cleaning and plating; automatic barrel finishing. Equipment employed in each process is described. (L general, 1-2, 18-24; 5-11)

557-L. Titanium-Clad Steel Sooner Than You Think. R. F. Domagala,

D. W. Levinson and W. Rostoker. *Product Engineering,* v. 28, Sept. 16, 1957, p. 111-113. (CMA)

Roll-cladding titanium to steel is a low-cost way to exploit titanium's corrosion resistance when embrittling intermetallic compounds, such as result from direct roll cladding, are obviated. By interleaving a layer of vanadium and copper between the steel and titanium, embrittling is prevented, sound bonding occurs and severe bending is possible. (L22; ST, *Ti*)

558-L. Coating Beats Heat. Paul A. Huppert. *Steel,* v. 141, Sept. 16, 1957, p. 135-136.

New ceramic insulates aluminum and prevents aluminum and its alloys from melting up to 1800° F. Coating also protects steels aluminized by hot dip or spray. (L27; Al)

559-L. New Ways to Fight Corrosion. Pt. 2. *Steel,* v. 141, Sept. 2, 1957, p. 158-160.

Organic coatings and their features in protecting steel and other metals from corrosion; zinc, aluminum and chromized coatings for steel protection. (L26, L15)

560-L. Preparation of Protective Coatings by Electrophoretic Methods. A. C. Werner, Vitro Corporation of America. (Wright Air Development Center), *U. S. Office of Technical Services,* PB 131062, Apr. 1957, 53 p. $1.50.

Electrophoretic methods were tested for the preparation of protective coatings which would make molybdenum suitable for continuous, long-term operation in an oxidizing atmosphere at 1800 to 2000° F. Multilayer coatings of 80% nickel, 20% chromium and nickel-bonded chromium carbide provided good static air-oxidation resistance. (L29p; Mo, *Cr,* Ni, SGA-h)

561-L. Research and Development on Electrodeposition of New Chromium and Chromium-Alloy Plate. L. D. McGraw, Battelle Memorial Institute. (Bureau of Aeronautics), *U. S. Office of Technical Services,* PB 111911, Dec. 1952, 82 p. $2.25.

Chromium-iron alloy plating bath which produces hard, bright chromium-iron plate with abrasion resistance and a crack system very similar to conventional chromium plate; improvement in the process for plating mat-type chromium-iron alloys. The only deterrent to commercial use is the problem of adhesion of the alloy plate to steel. (L17; *Cr*)

562-L. (English.) **Chemical Polishing of Titanium Alloys.** Shigetake Okamoto. *Government Mechanical Laboratory, Journal,* v. 3, no. 1, 1957, p. 59-60. (CMA) (Also in *Journal of Mechanical Laboratory,* v. 11, May 1957, p. 84-86—Japanese.)

A study of the chemical polishing of titanium alloys in H_2SO_4 shows that best results are obtained when the acid is boiling, the concentration is 80-90% and the polishing time is 10-30 min. The alloys applicable are Ti-Cr-Mo, Ti-Ni, Ti-Cr, Ti-Ag, Ti-Mn, Ti-Fe, Ti-Mo, Ti-Cu, Ti-Co and Ti-Mo-Al. (L12g; Ti)

563-L. (French.) **Shot for Sand Removal. Cost of Use.** *Journal d'Informations Techniques des Industries de la Fonderie,* no. 88, July 1957, p. 15-17.

Economics of consumption as influenced by wearing out and loss of shot; how to reduce shot losses. (L10c, E24)

564-L. (Japanese.) **Examples of Hard Facing by Welding.** Shigeichi Maekawa, Taki and Izumi Hasegawa. *Metals,* v. 27, Aug. 1957, p. 614-616.

Characteristics of hard facing by welding; examples of hard facing on wheels and measurements of its wearing properties. (L24, Q9)

565-L. (Japanese.) **Plating of Bumpers.** Matsumoto. *Metals,* v. 27, Aug. 1957, p. 645-649.

Comparison of plating systems for car bumpers in United States and Japan. (L17, T21c)

566-L. (Portuguese.) **Zinc Plating of Steel Wire.** Eduardo Pyles Lozano and Gelio M. Gozzo. *ABM, Associacao Brasileira de Metais, Boletim,* v. 13, Apr. 1957, p. 165-170.

Description of former primitive electroplating installation in plant of Mineracao Geral do Brasil Ltda. and improvements made in construction of new plating line. (L17, 1-2; ST, *Zn,* 4-11)

567-L. Sprayed Molybdenum and Its Applications. Sheila M. Wright. *Alloy Metal Review,* v. 8, Sept. 1957, p. 2-8.

Properties of coatings, spraying techniques and applications. 6 ref. (L23; Mo)

568-L. Learning Metalworking With Aluminium. Pt. 27. John C. Older. *Light Metals,* v. 20, Sept. 1957, p. 286-287.

Elementary instructions for etching designs on aluminum. (L12g; Al)

569-L. Gyrofinishing. *Metal Finishing Journal,* v. 3, Sept. 1957, p. 360-362.

Gyrofinishing, a new process suitable for buffing and polishing zinc alloy, aluminum, brass or stainless steel parts immerses fixtured parts into rapidly rotating abrasive medium. (L10d; Zn, Al, Cu, SS)

570-L. Stress-Free Nickel Plate. Edward Calderon. *Metal Finishing Journal,* v. 3, Sept. 1957, p. 373-374.

Experiences in plating nickel on stainless steel, Inconel-X and alloy A286 with sulphamate electrolyte; high-purity, ductile, stress-free nickel deposits obtained. (L17; SS, Ni)

571-L. Surface Treatment and Finishing of Light Metals. S. Wernick and R. Pinner. *Organic Finishing,* v. 18, Aug. 1957, p. 15-23, 27.

Surface preparation and mechanism of corrosion prevention by paint. Protective values, adhesion, formulation and characteristic of different primer and top coat systems for aluminum under marine, rural or industrial conditions. 16 ref. (L26n; Al)

572-L. (Czech.) **Possibilities of Improving Life of Steel Rolls by Hand-Operated Weld Surfacing.** Milan Zidek. *Hutnicke Listy,* v. 12, no. 2, 1957, p. 110-116.

Abrasion resistance of rolls increased by manual weld surfacing of rolls with 18-8 chromium nickel austenitic steel; increasing carbon content and cold working of weld resulted in greater resistance to abrasion. (L24, W23k, 17-7; ST, *SS*)

573-L. Sprayed Molybdenum and Its Applications. S. M. Wright. *Alloy Metals Review,* v. 8, Sept. 1957, p. 2-8. (CMA)

Vapor spraying of molybdenum results in the interlocking of small particles on the sprayed surface. The porosity accounts for the general average density of 90%. Hardness values of the deposit are misleading and cover a wide range. Applications of sprayed molybdenum are described. (L23; *Mo*)

574-L. Dow Latex 566: Gloss Systems for Metal. M. C. Carpenter. *American Paint Journal,* v. 42, Oct. 7, 1957, p. 88, 89, 92, 94.

Coating developed specifically for baked metal applications involves conversion of polymer into more thermosetting structure through effect of heat and catalysis. Pigment dispersion and wetting, pigment volume concentration and mechanism of film formation. Application is by spray. (L26p)

575-L. Precision Barrel Finishing. Pt. 4. William E. Brandt. *Automatic Machining,* v. 18, Sept. 1957, p. 51-57.

Examples used to demonstrate tumbling procedure and method of determining load percentage, slip size, water level and fixturing in finishing steel and nonferrous parts. (L10d)

576-L. Continuous Wire Plating Replaces Batch Process. *Automation,* v. 4, Oct. 1957, p. 67-68.

Continuous processing line built by Hanson-Van Winkle-Munning Co. in service at Wilbur B. Driver Co. cleans and triple-plates four strands of wire simultaneously. Cleaning, nickel strike, silver strike, silver plating, rinsing and drying operations are performed on wire traveling at 5 fpm., with given point on wire passing through system in about 10 min. (L17, L12, 1-11; 4-11)

577-L. How to Trace and Correct Defects in Aluminum Enamels. Paul A. Huppert. *Ceramic Industry,* v. 69, Sept. 1957, p. 96-97.

Causes of defects, including those attributable to base metal; corrective measures. (L27; Al, 9)

578-L. How to Combat Defects in Pickling Operations. *Ceramic Industry,* v. 69, Sept. 1957, p. 98 and following. (Two pages of tables)

Maytag Co. controls and analyzes metal surface preparation in order to avoid application difficulties and defects in porcelain enamel finishes. Tables of defects and possible causes requiring control, operating conditions, pickling process details, analysis schedule are included herein. (L27, L12g, 9)

579-L. Painting Structural Steel With Airless Spray. J. G. Pankratz. *Industrial Finishing,* v. 33, Sept. 1957, p. 64-66.

Paint is drawn from drum through heater to airless spray gun under 500-600 psi. pressure. Volatile portion of solvent with pressure provides finely atomized spray. Relatively little overspray permits painting in the open shop. (L26; ST, SGB-s)

580-L. The Chemical Treatment of Nickel, Nickel-Chromium and Chrome-Iron Alloys Prior to Electrodeposi-

tion. E. Morley. *Institute of Metal Finishing, Transactions,* v. 33, 1955-56, p. 102-104.

Principle employed is reduction by cathodic treatment of oxide film formed when the work has been treated anodically. Technique refers mainly to fusion of glass to copper-plated chromium alloys. (L13; Ni, Cr, Fe)

581-L. Alkaline Electro-Brightening and Anodizing of Aluminum. N. D. Pullen and B. A. Scott. *Institute of Metal Finishing, Transactions,* v. 33, 1955-56, p. 163-176.

Details of process which involves two stages; anodic treatment at 12 volts d.c. in a hot alkaline electrolyte followed by normal anodizing in dilute sulphuric acid electrolyte. 11 ref. (L19n; Al)

582-L. Some Studies of Phosphoric Acid-Based Chemical Brightening Solutions for Aluminum. A. W. Brace and T. S. De Gromoboy. *Institute of Metal Finishing, Transactions,* v. 33, 1955-56, p. 177-197.

Operating characteristics of various baths, such as amount of metal dissolved for various treatment times, effect of temperature, amount of aluminum dissolved before bath became exhausted and response of various alloys. Mixtures investigated were phosphoric-sulphuric acid, phosphoric-sulphuric-nitric acid, phosphoric-acetic-nitric acid and phosphoric acid-water-nitric acid. 9 ref. (L12g; Al)

583-L. Studies in Bright Anodizing by the Ammonium Bifluoride-Nitric Acid Process. G. E. Gardam and R. Peek. *Institute of Metal Finishing, Transactions,* v. 33, 1955-56, p. 198-210.

Determination of satisfactory concentrations of nitric acid and ammonium bifluoride, effect of lead and other additions and of temperature. 3 ref. (L19; Al)

584-L. Chemically Brightened and Anodized Aluminum and Its Employment in Automobile Manufacture. F. Baumann and H. Neunzig. *Institute of Metal Finishing, Transactions,* v. 33, 1955-56, p. 211-225.

Practical use of ammonium bifluoride process for treatment of strip-trim, window frames and bumpers. Defects of the material and procedures suitable for testing quality of anodic film. 7 ref. (L19, T21c, 17-7; Al)

585-L. Smoothing of Mild Steel by Barrel Treatment in Oxalic Acid-Hydrogen Peroxide Solution. K. Sachs and M. Odgers. *Institute of Metal Finishing, Transactions,* v. 33, 1955-56, p. 245-269.

Influence of initial surface texture, period of immersion and agitation by barrelling on chemical polishing of mild steel in Marshall's solution. 4 ref. (L12g; CN)

586-L. Electrodeposition of Tin-Zinc Alloys From Stannate-Complexone Solutions. A. E. Davies and R. M. Angles. *Institute of Metal Finishing, Transactions,* v. 33, 1955-56, p. 277-285.

Substitution of trisodium salt of N-hydroxyethyl-ethylenediamine triacetic acid for sodium cyanide in alkaline tin-zinc baths permits deposition of satisfactory alloy deposits from a cyanide-free solution. 6 ref. (L17; *Sn, Zn*)

587-L. A Preliminary Investigation of the Formation of Cracks in Hard Chromium Electrodeposits and the Evolution of Hydrogen During Deposition. C. P. Brittain and G. C. Smith. *Institute of Metal Finishing, Transactions,* v. 33, 1955-56, p. 289-305.

It was found that the release of bubbles of hydrogen from the surface of the cathode is a discontinuous process, occurring for definite periods at regular intervals. Periodic cracking of surface of cathode was found to be associated with the discontinuous evolution of hydrogen. 4 ref. (L17, *Cr, H*)

588-L. Automatic Plant for Bright Zinc Plating. J. Chadwick. *Institute of Metal Finishing, Transactions,* v. 33, 1955-56, p. 314-327.

Essential processes for plating steel motor car accessories, details of tank construction and plant operation. (L17, 1-2; Zn)

589-L. Industrial Nickel Coating by Chemical Catalytic Reduction. Gregoire Gutzeit. *Institute of Metal Finishing, Transactions,* v. 33, 1955-56, p. 383-423.

Process for depositing an amorphous, pore-free, high nickel-low-phosphorus alloy on metals and non-metals. Composition, structure, corrosion resistance, physical and mechanical properties, applications and limitations. 32 ref. (L28; Ni)

590-L. Practical Brush-Plating. H. D. Hughes. *Institute of Metal Finishing, Transactions,* v. 33, 1955-56, p. 424-442.

Technique by which electrodeposits are made from electrolytes held in absorbent materials attached to

portable electrodes. Requirements for solutions, anodes, electrical system and absorbent materials; characteristics of deposits; applications. 2 ref. (L29)

591-L. Etch Stainless Plaques Quickly and Profitably. *Iron Age,* v. 180, Sept. 12, 1957, p. 132-133.

Method and solutions for etching stainless steel. (L12g)

592-L. Solvent Degreasing. A Valuable Industrial Process. W. L. McCracken. *Iron and Steel Engineer,* v. 79, Aug. 1957, p. 73-80.

Review of solvent vapor cleaning, characteristics of trichlorethylene and perchlorethylene solvents, typical degreasing cycles and equipment. Equipment design considerations, operations and maintenance. (L12h, 1-2)

593-L. Vapor Stripping of Stop-Off Coatings. Edward R. Jorczyk. *Metal Finishing,* v. 55, Oct. 1957, p. 63-64.

Use of methylene chloride in a vapor degreaser. Stripping is possible of many types of organic coatings such as lacquers, paint, enamels and varnishes. (L12j)

594-L. Barrel Finishing. Pt. 3. Deburring and Allied Processes. Arthur S. Kohler. *Metal Finishing,* v. 55, Oct. 1957, p. 68-73.

Tumble flushing; shine rolling; burnishing; deburring; chip deburring; descaling; effect of shape of the parts on the amount of barrel action; surface finishes; choice of methods to use. (L10d)

595-L. Process for the Deposition of Molybdenum Inside Large-Bore Tubing. A. Hegarty. *Metal Finishing, Journal,* v. 3, Sept. 1957, p. 349-352. (CMA)

Work at National Research Corp. on the hydrogen reduction of $MoCl_5$ showed that reduction was most efficient at 20 mm. Hg, that sufficiently pure $MoCl_5$ could be obtained by heating the commercial material at 1 mm. Hg and 100° C. for 1 hr., and that no discontinuities built up on the surface. 3 ref. (L28; *Mo*)

596-L. Thick Oxide Films on Aluminum Alloys. (Continued.) Preparation by Direct Current With Special Reference to Hard Anodizing. J. M. Kape. *Metal Industry,* v. 91, Sept. 6, 1957, p. 217-219, 222.

Anodic films removed from various Hiduminium and other alloys and produced by anodizing in electrolytes of various compositions show a uniformity of composition with regard to oxide content and acid content. The composition was found to be independent of the anodizing conditions in sulphuric acid electrolytes. (To be continued.) 5 ref. (L19; Al)

597-L. Electro-Chemical Deposition. J. W. Oswald. *Metal Industry,* v. 91, Sept. 17, 1957, p. 273-274.

Nickel and chromium electrodeposition processes at Fescol Ltd. can handle work up to six tons in weight and 15 ft. in length. (L17; *Ni, Cr*)

598-L. Hard-Surfacing Weld Materials. W. A. Martin. *Ontario-Hydro Research News,* v. 9, Jan-Mar. 1957, p. 26-29.

Applications of weld hard-facing method of repair; types and causes of metal wear; choice of gas or arc welding; types and characteristics of hard-facing materials; testing of weld deposit quality. (L24)

599-L. Bright Nickel Plating in the Costume Jewelry Industry. Eugene N. Castellano. *Plating,* v. 44, Oct. 1957, p. 1083-1085.

Control and operation of bright nickel solutions; effects and advantages of bright nickel plating. (L17, T9s; *Ni*)

600-L. Phosphating Processes and Their Applications in Metal Finishing. Pt. 3. Theoretical Aspects. D. J. Fishlock. *Product Finishing,* v. 10, Aug. 1957, p. 82-92.

Fundamental reactions, effect of cleaning and mechanical treatment on phosphate film, typical phosphate solution compositions and thickness, corrosion resistance and other characteristics of phosphate coatings. (L14b)

601-L. Barrels of Savings. Ross Hill. *Western Metals,* v. 15, Sept. 1957, p. 49-52.

Note on barrel finishing and its advantages. (L10d)

602-L. Plating by Ultrasonics. *Chemical and Engineering News,* v. 35, Nov. 4, 1957, p. 50-51.

Acoustical energy improves chromium coatings; intricate shapes are brighter, harder, better covered. (L17, 1-24; *Cr*)

603-L. Corrosion-Resistant Coatings —Natural, Chlorinated and Synthetic Rubber. E. G. Rawlings. *Corrosion Technology,* v. 4, Aug. 1957, p. 283-286.

Coatings for protecting steel and other metals from corrosive environment. (L26r)

604-L. Approved Method of Applying Cermet Coatings. *Engineer,* v. 204, Sept. 20, 1957, p. 436-437.

Rapid economical process at National Bureau of Standards, employs ordinary ceramic coating procedures to replace former flame-spraying method and provides hard, high-temperature facing for metal parts. (L27; 6-20)

605-L. Cleaning and Electroplating of Magnesium. *Industrial Finishing,* v. 9, Sept. 1957, p. 792-801.

Solutions and procedure for alkaline cleaning, pickling with sulphuric acid, chromate-nitrate solution, acetic-nitrate solution, chromate-nitrate-hydrochloric solution, mechanical finishing and electroplating following zinc immersion coating and copper striking of the magnesium parts. (L12, L17; Mg)

606-L. Mechanism of Electrochemical Polishing. *Industrial Finishing,* v. 9, Sept. 1957, p. 802-803.

Material from recent Russian publication on mechanism of electrochemical polishing of steel, copper and nickel. 4 ref. (L13p; ST, Cu, Ni)

607-L. Flame-Sprayed Zinc Layers. E. Gebhert and H. D. Seghezzi. *Industrial Finishing,* v. 9, Sept. 1957, p. 804-808.

Tensile, hardness, impact, bend, compression and adherence properties of flame-sprayed zinc coatings. Effect of test piece thickness and flame adjustment on properties. (L23, Q general; *Zn*)

608-L. Chromic Acid Rinse Treatment. Radiometric Evaluation. S. L. Eisler. *Industrial Finishing,* v. 9, Sept. 1957, p. 818-821.

Radioactive chromium-51 used to measure adsorption of chromic acid from rinse by phosphated steel following treatment to produce coating of zinc or manganese phosphate. 6 ref. (L14b; Cr, 14-13)

609-L. Versatile Arrangement of Modern Finishing Line for Large-Scale "Job Shop" Processing. Frank X. Vasso. *Industrial Heating,* v. 24, Oct. 1957, p. 2095-2102.

Automatic continuous conveyor line with variable speed control, a five-stage washer, an electrostatic spray system and drying and baking ovens. (L26n, W12r, 1-2)

610-L. Effects of Ultrasonics on the Electrolytic Deposition of Metals. A. Roll. *Metal Finishing,* v. 55, Sept. 1957, p. 55-58, 63.

Literature review. Variations in hardness, pitting, deposition rate, surface appearance and current efficiency with the presence of ultrasonic vibration in plating bath for electrodeposit of Ni, Cr or Ag. 10 ref. (L17, 1-24; *Ni, Cr, Ag*)

611-L. Barrel Finishing. Arthur S. Kohler. *Metal Finishing,* v. 55, Sept. 1957, p. 59-63.

Barrel finishing, auxiliary barreling equipment, types and compositions of tumbling media, cutting, cleaning, burnishing, and descaling compounds used in barrel finishing. (To be concluded.) (L10d, 1-2)

612-L. Thick Oxide Films on Aluminium Alloys. J. M. Kape. *Metal Industry,* v. 91, Sept. 20, 1957, p. 239-240.

Variations in abrasion resistance, appearance and porosity of anodic films on aluminum alloys with different electrolytes and anodizing conditions. (L19; Al)

613-L. Automatic Plating in the Lock Industry. *Metal Industry,* v. 91, Oct. 4, 1957, p. 298-300.

Fully automatic Cu-Ni-Cr plating plant has been installed at the Yale and Towne Mfg. Co., Willenhall, Staffs, England. (L17, T6s, 17-7; Cu, Ni, Cr)

614-L. An Examination of Oxide Films on Tin and Tinplate. S. C. Britton and K. Bright. *Metallurgia,* v. 56, Oct. 1957, p. 163-168.

Oxide films formed at various temperatures and in passivating solutions have been studied by controlled cathodic examination of films detached from the metal to obtain evidence of their composition. 12 ref. (L14a; Sn)

615-L. Here Are 10 Steps in Black Anodizing Aluminum Die Castings. *Precision Metal Molding,* v. 15, Nov. 1957, p. 56-57.

Particularly in machining die castings, many small-diameter, hard to reach holes must be drilled and tapped. (L19, G17e; Al, 5-11)

616-L. Color and Textures for Aluminum. R. V. Vanden Berg. *Product Engineering,* v. 28, Sept. 30, 1957, p. 101-108.

Range of surface treatment, mechanical, chemical and electrochemical and coloring methods give aluminum textures and colors for wide variety of uses. (L10, L12, L13; Al)

617-L. Testing and Examination of Electrodeposits. R. Quarendon. *Product Finishing,* v. 10, Sept. 1957, p. 79-89.

Sources of information; types of atmosphere, test arrangements, choice of test articles, accelerated tests and evaluation and assessment of results. 20 ref. (L17c)

618-L. Phosphating Processes and Their Applications in Metal Finishing. Pt. 4. Typical Processes. D. J. Fishlock. *Product Finishing,* v. 10, Sept. 1957, p. 94-104, 132.

Process details for phosphating aluminum, magnesium, zinc and cadmium surfaces for improving bonding of paint or coating subsequently applied. Phosphating treatments for improving corrosion resistance of aluminum, magnesium, cadimum, zinc and steel parts and structures. Phosphate coats for drawing, extruding and cold forming. 18 ref. (L14b; Al, Mg, Zn, Cd)

619-L. Barrel Tumbling. How to Get Best Results. R. W. Fitch. *Product Finishing,* v. 22, Oct. 1957, p. 28-42.

Recommendations on media, water level, cleaning compound, abrasive additives, barrel speeds, rinsing, drying, and separation of media from parts in barrel finishing operations. (L10d)

620-L. Chromate Conversion Coatings on Hot Dipped Galvanize. Charles W. Ostrander. *Product Finishing,* v. 22, Oct. 1957, p. 60-72.

Historical development, definition, protective value, hardness and bonding properties; operations in treating galvanize and present uses of chromate conversion coating on hot dip galvanized steel. (L14c, L16; ST, *Zn*)

621-L. Mastics for Corrosion Control. W. W. Henderson. *Tappi,* v. 40, Sept. 1957, p. 216A-219A.

Mastics as corrosion control coatings in all industries using steel, tankage, and iron or steel equipment; types and uses of *Erkote* mastics; recommendations for pretreatment of surfaces and for application of mastics. (L26; ST, CI)

622-L. Oxidation-Resistance Coating for Molybdenum. J. R. Blanchard. Climax Molybdenum Co., Quarterly Progress Report no. 3 Under Contract AF 33(038)-16197. *U. S. Office of Technical Services,* PB 123584. July 1953, 9 p. (CMA)

Phases of the program which were studied in the period covered by the report were simplification of coatings, sustaining of plastic deformation at 1800° F., and gradient-temperature oxidation tests. (L general; Mo, SGA-h)

623-L. (Czech.) **Rinsing Type of Rust Removers.** M. Svoboda and B. Knapek. *Korose a Ochrana Materialu,* v. 1, no. 1, 1957, p. 3-6.

Various types of rinsing rust removers; consideration of different phosphoric acid and butyl alcohol rinses. Most convenient and active rinse is composed of 32-35% phosphoric acid and 2% butyl alcohol. 3 ref. (L12)

624-L. (Czech.) **Plating of Parts Made of Powdered Metals.** O. Mudroch. *Korose a Ochrana Materialu,* v. 1, no. 1, 1957, p. 6-10.

Expulsion of liquids trapped in pores; sealing of pores; plating by usual methods; application of various coatings; results of experiments on corrosion of plated parts. 3 ref. (L17; 6-22)

625-L. (Czech.) **Economic Analysis of Rinsing. Pt. 1.** Jan Navratil. *Korose a Ochrana Materialu,* v. 1, no. 2, 1957, p. 17-21.

Determination of optimal conditions of rinsing in a normal tank; equation for loading function of rinsing; cost of rinsing is dependent on number of items treated and content of storage tank. (L12)

626-L. (French.) **Annual Conference on Hard Chromium.** *Métallurgie et la Construction Mécanique,* v. 89, Sept. 1957, p. 745-747.

Summary of six papers submitted at the Centre Marcellin-Berthelot: influence of electrolytic polishing and hard chromium plating on fatigue resistance; technique of nondestructive metallographic examination; study of chromium-plating baths by means of radioactivity; improvement of throwing power and cathodic efficiency of chromium plating baths; influence of impurities on bright nickel-plating baths. (L17; *Cr*)

627-L. (German.) **The Al-Fin Composite Casting Process.** Eduard Betram. *Giesserei,* v. 44, Sept. 26, 1957, p. 593-602.

Properties of the Aluminum-fin layer. Applications of the process. 12 ref. (L22; Al)

628-L. (French.) **Installations for Manufacture of Tin Plate.** J. Breuzet. *Technique Moderne,* v. 49, July 1957, p. 407-412.

Properties, uses, perspectives for future use of tin plate; manufacture and characteristics of black iron intended for tin plating; tin plating methods; description of modern hot and electrolytic galvanizing equipment and operating principles; description of a "Ferrostan" line. (L17, 1-2; ST, *Sn*)

629-L. (French.) **Strip Galvanizing.** Jean Landeau. *Technique Moderne,* v. 49, July 1957, p. 413-415.

Brief notes on Sendzimir, U. S. Steel and Wheeling Steel strip galvanizing processes. Layout of a Sendzimir line and process details. Advantages of strip galvanizing. (L16; ST, *Zn,* 4-3)

630-L. (Russian.) **Pickling of Stainless Steel.** A. A. Babakov, A. A. Sabinin and I. P. Sinitsyn. *Stal',* v. 17, July 1957, p. 631-636.

Application of heat treatment to high-Cr stainless steel treated with solution of sodium chloride and nitrate renders removing of the scale much easier on subsequent pickling. (L12g; SS)

631-L. (Czech.) **Use of Flux in Hot-Dip Coating Aluminum.** L. Malek. *Korose a Ochrana Materialu,* v. 1, no. 2, 1957, p. 21-26.

Chemical properties of the various materials (borax, potassium fluozirconate and potassium fluotitanate); function of flux, technology of application of the coating. 4 ref. (L16; Al)

632-L. (German.) **Corrosion Protection of Base Metals With Chromium Plating.** Heinz W. Dettner. *Industrie-Anzeiger,* v. 79, no. 64, Aug. 9, 1957, p. 967.

Chromium dip plating procedure is cheaper and simpler than the electrolytic process and has broad field for future development. (L16; *Cr*)

633-L. (German.) **Use of Electrolytic Tinplate.** W. R. Lewis. *Werkstoffe und Korrosion,* v. 8, Aug-Sept. 1957, p. 456-462.

Use of continuous steel strip prepared by the cold reduction process for tinplate and the resulting reduction in coating weight; results on tinplate are more difficult in soldering and less corrosion resistance. To avoid such defects, lacquer coatings may be added to the tinplate or a combination of hot dipping and electrolytic plating used. 9 ref. (L17; ST, *Sn*)

634-L. (German.) **Oxide Formation of Precious Metals by Cathode Sputtering.** Tadasu Suzuki. *Zeitschrift für Naturforschung,* v. 12a, June 1956, p. 497-499.

Silver, gold and platinum were cathode sputtered under pressure and tested by interferometer. Silver and platinum developed oxide, but not gold. (L25h, R1h; Ag, Au, Pt)

635-L. (Italian.) **Initial Polarization of the Electrode as the Determining Parameter in the Formation of "Aluminum Blacks".** L. Guerreschi. *Chimica e l'Industria,* v. 39, Sept. 1957, p. 755-759.

Investigation of mechanism of formation of "Al blacks". Experiments and data obtained. 10 ref. (L17; Al)

SECTION M

METALLOGRAPHY, CONSTITUTION and PRIMARY STRUCTURES

1-M. The Constitution of Delta-Phase Alloys of the System Uranium-Molybdenum-Titanium. Henry A. Saller, Frank A. Rough, Arthur A. Bauer and J. Robert Doig. *Battelle Memorial Institute (U. S. Atomic Energy Commission),* BMI-1134, Sept. 1956, 16 p.

Phase relationships between the delta phases of the uranium-molybdenum and uranium-titanium systems presented on the basis of thermal-analysis data obtained and metallographic and X-ray examination of heat treated and quenched specimens. (M24; U, Ti, Mo)

2-M. Metallography as an Aid to Electrodeposition. A. Comley. *Electroplating and Metal Finishing,* v. 9, Nov. 1956, p. 355-361.

Metallographic techniques, their application to problems such as roughness, nodules, pits and other defects, laboratory layout.
(M general; 8-12, 9-21)

3-M. The Constitution of Tin-Indium Alloys in the Range 0-30 Per Cent Indium. J. C. Blade and E. C. Ellwood. *Institute of Metals, Journal,* v. 85, Sept. 1956, p. 30-32.

Equilibrium relationships at the tin-rich end of the tin-indium diagram; 8% of indium is soluble in tin at 205° C. and about 6% at 50° C. (M24; Sn, In)

4-M. Debye Characteristic Temperatures of Certain Noncubic Crystals. D. D. Betts, A. B. Bhatia and G. K. Horton. *Physical Review,* v. 104, ser. 2, Oct. 1, 1956, p. 43-47.

Characteristic temperatures of representative hexagonal, tetragonal and trigonal crystals evaluated by an expansion of the integrand involved in terms of harmonic polynomials, having the same symmetry as the corresponding Christoffel equations of elasticity theory. (M26)

5-M. Measurement and Calculation of Ferrite in Stainless-Steel Weld Metal. W. T. DeLong, G. A. Ostrom and E. R. Szumachowski. *Welding Journal,* v. 35, Nov. 1956, p. 521s-528s.

MagneGage is a useful and reliable instrument for measurement of ferrite if properly used on as-welded specimens. New constitution diagram for stainless-steel weld metal. (M23, M24, SS)

6-M. Fracture Grain Size, Austenite Grain Size, and Martensite Structure. B. D. Enlund. *Henry Brutcher Translation No.* 3207, 3 p. (From *Jernkontorets Annaler,* v. 134, no. 11, 1950, p. 553-555.) Henry Brutcher, Altadena, Calif.

Previously abstracted from original. See item 64-M, 1951.
(M27; CN)

7-M. X-Ray Study of Structure of Chips Obtained in Metal Cutting. S. I. Gubkin and L. T. Mendeleev. *Henry Brutcher Translation No.* 3311, 5 p. (From *Doklady Akademii Nauk SSSR,* v. 95, no. 1, 1954, p. 73-74.) Henry Brutcher, Altadena, Calif.

Previously abstracted from original. See item 219-M, 1954.
(M27, G17; Cu, Al, ST, Zn)

8-M. Alloys of Chromium With Platinum, Iridium, Rhodium, and Ruthenium. E. Raub and W. Mahler. *Henry Brutcher Translation No.* 3821, 15 p. (From *Zeitschrift Metallkunde,* v. 46, no. 3, 1955, p. 210-215.) Henry Brutcher, Altadena, Calif.

Previously abstracted from original. See item 158-M, 1955.
(M24, P general; Cr, Pt, Ir, Rh, Ru)

9-M. (English.) A Note on the Determination of Crystal Orientations by the Back-Reflection Laue Method. Jiro Watanabé. *Science Reports of the Research Institutes, Tohoku University,* ser. A, v. 8, no. 5, Oct. 1956, p. 385-390.

Crystal orientation is determined by calculating the inclination of the specimen axis to known crystal planes or zone axes which develop sharp spots or hyperbolas in photographs. (M22; Fe, Zn, Bi, Sn)

10-M. (Dutch.) **Geometric Description of Dislocations.** W. G. Burgers. *Metalen,* v. 11, no. 20, Oct. 31, 1956, p. 451-457.

Dislocations of the "line", "screw", "edge" and "incomplete" types are related by "Burgers vector". (M26b; Co)

11-M. (French.) **Developing Polygon Formation in Iron by the Interferential Phase Method.** Georges Cizeron and Pierre Coulomb. *Comptes Rendus,* v. 243, no. 15, Oct. 8, 1956, p. 1037-1040.

An electrolytically polished surface, observed by the interferential phase method, revealed sub-links of polygon formation in ions in various states of impurities and after various treatments. (M25; Fe)

12-M. (Russian.) **The Effect of the Type of "Carburetor" Smelting on the Macrostructure of Cast Steel.** P. G. Vinnichenko. *Liteinoe Proizvodstvo,* no. 9, Sept. 1956, p. 21-22.

Compares crystallization in steels melted by the "carburetor" process with ferromanganese in one case and with manganese ore in the other. The first type shows crystallization of a more pronounced dendritic nature.
(M28h, N12; AD-n, AD-s, ST)

13-M. Dislocations and Plastic Flow in Germanium. Earl S. Greiner and William C. Ellis. *Bell Laboratories Record,* v. 34, Nov. 1956, p. 403-406.

Conductivity studies demonstrate the introduction of other imperfections in plastic flow, and provide means for identifying the types of these imperfections and estimates of their concentrations.
(M26b, Q24; Ge)

14-M. The Determination of the Alpha Phase Boundaries of the Iron-Nitrogen System by Internal Friction Methods. R. Rawlings and D. Tambini. *Iron and Steel Institute, Journal,* v. 184, Nov. 1956, p. 302-308.

Solubility of Fe_4N in iron was determined using the internal friction method. Equilibrium was approached by nitriding for comparison with the results obtained by precipitation by Dijkstra.
(M24b, Q22; Fe)

15-M. The Palladium-Tritium System at Low Temperature. R. M. Haag and F. J. Shipko. *Knolls Atomic Power Laboratory (U. S. Atomic Energy Commission),* KAPL-1097, June 1956, 40 p.

Equilibrium was readily obtained at 0. C. Below this, production of He-3 by radioactive decomposition of tritium imposed limits upon the duration of any run, and, in conjunction with slower reaction rates, decreased precision. (M24b; Pd)

16-M. Metal Whiskers. G. W. Sears and S. S. Brenner. *Metal Progress,* v. 70, Nov. 1956, p. 85-89.

The strength of small metal whiskers is close to the theoretical value. Strength decreases as size increases although many other of the unusual properties are retained.
(M26, N2, Q23n, 14-11)

17-M. Electronic Properties of Thorium, Uranium and Plutonium. I. Atomic Energy Levels. Guy W. Lehman. *North American Aviation, Inc. (U. S. Atomic Energy Commission),* NAA-SR-1659, Nov. 1956, 19 p.

The low-lying one-electron term values and atomic wave function. Effect of spin-orbit interaction.
(M25, P10; Th, U, Pu)

18-M. Etchpits and Dislocations in Zinc Single Crystals. A. H. A. Méléka. *Philosophical Magazine,* v. 1, ser. 8, no. 9, Sept. 1956, p. 803-811.

High-purity zinc single crystals were etched in 0.1% iodine in alcohol and the distribution of the etch pits was studied.
(M26s, M26b, M20q; Zn, 14-11)

19-M. Quenching Vacancies in Platinum. F. J. Bradshaw and S. Pearson. *Philosophical Magazine,* v. 1, ser. 8, no. 9, Sept. 1956, p. 812-820.

It was found that the electric resistance after quenching was greater than its original value but that the increase could be removed by annealing at temperatures in the region of 400° C.
(M26s, P15g, J26, J23; Pt)

20-M. The Stress to Move a Free Dislocation in Alpha Iron. J. Heslop and N. J. Petch. *Philosophical Magazine,* v. 1, ser. 8, no. 9, Sept. 1956, p. 866-873.

The portion of this stress due to interaction with random carbon and nitrogen atoms is temperature-independent. At low temperatures, a very temperature-dependent portion is dominant. (M26b, Q25, 2-11; Fe)

21-M. The Metallographic View. XXVIII. Metallography of Nitrided Cases. Howard E. Boyer. *Steel Processing,* v. 42, Nov. 1956, p. 639-640.

Microstructure and hardness of an aluminum-bearing nitriding steel. (M27, Q29; AY)

22-M. Fundamental Concepts of Matter in the Solid State. M. J. P. Musgrave. Paper from "Chemical Engineering Practice". v. II. Academic Press. p. 1-67.

Shows now the variations of the mechanical properties of solids, both in degree and kind, are closely related to the fundamental crystal structure. (M26, Q general)

23-M. Alloy Equilibrium Diagrams. R. N. Parkins. Paper from "Chemical Engineering Practice". v. II, Academic Press. p. 113-142.

The basic types of structure observed in alloy systems are considered in relation to the properties of metallic materials. (M24)

24-M. (German.) **Introduction to the Science of Dislocations by Means of Symbols and Models.** E. Knuth-Winterfeldt. *Radex Rundschau,* no. 7, Oct. 1956, p. 315-326.

Introduces dislocation of edge screws and combined dislocations by means of combination models and elastic models. (M26b)

25-M. (German.) **Investigation on the Type and Distribution of Nonmetallic Inclusions in Ingots Made of Effervescent Soft Openhearth Steel.** Hubert Hoff, Heinz Lessing and Georg Masing. *Stahl und Eisen,* v. 76, no. 22, Nov. 1, 1956, p. 1442-1452 + 2 plates.

A study of inclusions isolated from 5-ton ingots by using the washing method. (M28h; ST, 5-9, 9-19)

26-M. (German.) **Grain Boundaries and Grain Boundary Matter in Commercial Ferrous Materials.** Hans-Kurt Görlich and Hermann Schenck. *Stahl und Eisen,* v. 76, no. 22, Nov. 1, 1956, p. 1479-1486.

The nature, properties and importance of grain boundaries and the matter between them in unalloyed steels. (M27f; CN)

27-M. (German.) **The Quasibinary Systems of Chromium Carbide Cr_7C_3 With the Carbides of Titanium, Tantalum and Tungsten.** O. Rüdiger. *Technische Mitteilungen Krupp,* v 14, no. 5, Nov. 1956, p. 136-139.

Determination of behavior and relationship to crystal structure; no continuous succession of solid solutions is formed.
(M24; Cr, Ti, Ta, W, NO-a35)

28-M. (Russian.) **Stability of Crystalline Structure of Solid Solution HgSe-TgTe System.** O. D. Elpat'evskaia, R. A. Konikova, A. R. Regel' and I. V. Iavorskii. *Zhurnal Tekhicheskoi Fiziki,* v. 26, no. 10, Oct. 1956, p. 2154-2156.

X-ray studies of different samples. Ranges of HgTe dissociation are established by means of vacuum evaporation. (M26p; Hg, Te)

29-M. The Nature of Mechanically Polished Metal Surfaces: The Surface Deformation Produced by the Abrasion and Polishing of 70:30 Brass. L. E. Samuels. *Institute of Metals, Journal,* v. 85, Oct. 1956, p. 51-62 + 4 plates.

Certain principles are established for methods by which surfaces free from serious strains may be produced by mechanical methods of polishing. Structure suggests that fine metallographic polishing operations occur essentially by a cutting mechanism. (M20p; Cu)

30-M. The System Uranium-Palladium. J. A. Catterall, J. D. Grogan and R. J. Pleasance. *Industrial Institute of Metals, Journal,* v. 85, Oct. 1956, p. 63-67 + 2 plates.

Preparation of alloys, metallography, thermal X-ray and chemical analysis, liquids, solid solutions, the compounds UPd, UPd_3 and U_5Pd_6. (M24b; U, Pd)

31-M. Thermal Acceptors in Germanium. Harry Letaw, Jr. *Physics and Chemistry of Solids,* v. 1, Sept.-Oct. 1956, p. 100-116.

Acceptors are identified as vacancies with 2 e.v. energy of formation. Annealing of thermally introduced acceptors is described by a mechanism involving the formation of divacancies as the first step. (M26s; Ge)

32-M. Observations on the Microstructure of a Brass Containing 67 Per Cent of Copper, Subjected to Alternating Bending Stresses. P. A. Jacquet. Paper from "International Conference on Fatigue of Metals". v. II. The Institution of Mechanical Engineers. 6p. + 7 plates.

Microscope reveals the crystallographic lattice of grains of alpha-brass which appear on the surface, and also in the deeper layers, under the effect of alternating stresses. The cracks are the direct consequence of these disorders, and develop further on subsequent annealing. (M26, 3-16; Cu, 9-22)

33-M. Quantitative Study of Substructure Characteristics and Correlation to Tensile-Property of Nickel and Nickel Alloy. Sigmund Weissmann. *Journal of Applied Physics,* v. 27, Nov. 1956, p. 1335-1344..

Application of a method combining X-ray microscopy and diffraction

analysis disclosed the co-existence of three orders of magnitude of substructural entities. These three orders are structurally interrelated and distinguished by different ranges of size, disorientation angle and lattice misalignment.
(M26, Q23n; Ni)

34-M. (Czech.) **New Views on Grinding and Polishing, Especially Metallographic Polishing.** Zdenek Ministr. *Hutnik,* v. 6, no. 9, Sept. 1956, p. 257-262.

Theoretical considerations. Excellent results obtained by using diamonds dispersed in a paste.
(M21p, L10b; NO-f47)

35-M. (Dutch.) **A Geometrical Description of Dislocations.** W. G. Burgers. *Metalen,* v. 11, no. 21, Nov. 1956, p. 477-482.

A study of the intersection of dislocation lines, dislocations in a closed network, incomplete cases and lattice defects. (M26b)

36-M. (French.) **A New Method to Prepare Thin Metallic Films for Electron Microscope Examination.** Noboru Takahashi and Kenji Kazato. *Comptes Rendus,* v. 243, no. 19, Nov. 5, 1956, p. 1408-1411.

A new method of obtaining the diffraction diagram and the microscopic picture of a selected portion of a specimen. Examples with various alloys. (M20r; 1-5)

37-M. (French.) **Cold Disorganization and Restoration of Aluminum Crystals Subjected to Low Tensile Stresses.** J. Caisso. *Publications Scientifiques et Techniques du Ministere de l'air,* 1956, no. 316, 46 p.

A low stress generally produces a dislocation and a more or less perfect restoration in crystals. One or the other can become predominant. According to the initial dislocation, one or two transition points are found at the beginning of the tension curve for elongation values depending upon the crystal orientation, its initial dislocation and direction of the stress. (M26, 3-16; Al)

38-M. (German.) **Copper-Lead Alloys. Consititution Diagram and Structure I. Formation of Binary Alloys.** *Metall,* v. 10, no. 21-22, Nov. 1956, p. 1023-1028.

Binary constitution diagram of copper-lead alloys of different ratios from 955 to 1020° C. (M24b; Cu, Pb)

39-M. (German.) **Examination With the Electron Microscope of Electrolytically Polished Metal Surfaces.** I. H. Poppa and H. Spähn. *Metalloberfläche* v. 10, no. 11, Nov. 1956, p. 329-335.

A study of the structure of various polished metal surfaces to determine optimum polishing procedures.
(M27, M20p)

40-M. (German.) **Accurate Determination of Lattice Constants by Means of a Counter-Tube Interference Goniometer.** Hans Neff. *Zeitschrift für Angewandte Physik,* v. 8, no. 10, Oct. 1956, p. 505-507.

The counter-tube-interference-goniometer was used in connection with the Cornu method for the accurate determination of lattice constants.
(M22, X4)

41-M. (Italian.) **Thermodynamic Investigations on Metallic Systems. IX. The Liquid System Zn-Bi-Pb.** Venanzio Valenti, Luigi Oleari and Mario Fiorani. *Gazzetta Chimica Italiana,* v. 86, no. 11, Nov. 1956, p. 930-941.

The electromotive method was used to detemine the sections of immiscibility at the isotherms of 440 and 520° C. for the zinc-bismuth-lead system. The three pseudobinaries studied coincided with the corresponding lines on the diagram.
(M24c; Pb, Bi, Zn)

42-M. (Book.) **Cobalt and Its Alloys.** 108 p. 1956. Battelle Memorial Institute, Columbus, Ohio.

A summary of allotropy and phase diagrams. (M24, N6p; Co)

43-M. **The Constitution of Copper-Rich Alloys of the Copper-Manganese-Aluminium System.** D. R. F. West and D. Lloyd Thomas. *Institute of Metals, Journal,* v. 85, No. 3, Nov. 1956, p. 97-104.

Constitution of copper-based alloys containing approximately 0-30 wt. % manganese and 0-18 wt % aluminum within the temperature range 800 to 400° C. Results presented in the form of isothermal sections. 20 ref. (M24c; Cu, Mn, Al)

44-M. **Lattice Spacings of the Silver-Rich Solid Solution Containing Magnesium and Antimony.** R. B. Hill and H. J. Axon. *Institute of Metals, Journal,* v. 85, No. 3, Nov. 1956, p. 109-116.

Measurements of the lattice spacings. Silver-rich solution comes into equilibrium with three compound phases. Atom-size considerations are discussed. 13 ref.
(M26p; Ag, Mg, Sb)

45-M. **Microstructure: Guide to Better Alloys.** W. R. Hibbard, Jr. *Iron Age,* v. 178, Dec. 20, 1956, p. 75-77.

New alloys can be designed on basis of microstructures offering optimum properties needed from mate-

rials; this is much quicker than usual approach. (M27, 17-1)

46-M. Structure of Bent Zinc Crystals. C. T. Wei and Paul A. Beck. *Journal of Applied Physics,* v. 27, Dec. 1956, p. 1508-1518.

Structure was studied by X-ray diffraction techniques. Zinc crystals, after being bent, were subdivided into subgrains. (M26n; Zn)

47-M. "Lozenge" and "Tadpole" Domain Structures in Silicon Iron Crystals. L. F. Bates and P. F. Davis. *Physical Society Proceedings,* v. 69, Pt. 11, Nov. 1, Sect. B, 1956, p. 1109-1111.

New photographs of these patterns are recorded and models are given for their interpretation.
(M27g; Si, Fe)

48-M. (English.) **Resistometric and Calorimetric Studies on the Precipitation in Aluminum-Silver Alloys.** G. Borelius and L. E. Larsson. *Arkiv Fur Fysik,* v. 11, no. 2, Feb. 22, 1956, p. 137-163.

Equilibrium phase diagram, formation of Guinier-Preston zones; resistivity-concentration diagram; diffusion mechanism.
(M24b, N7b, N1c; Al, Ag)

49-M. (German.) **Observations on Peaks in 18-8 Cr-Ni Steel Under the Field Electron Microscope.** Ferdinand Stangler. *Zeitschrift der Physik,* v. 146, Oct. 1956, p. 496-504.

A process for etching 18-8 steel wire by electronic means. A simple apparatus permits uniform etching. Images obtained are reproducible, but clear meaning is still lacking. Various shapes of peaks were observed during annealing at the high voltage applied, on the basis of emission images. (M21e; SS)

50-M. (Japanese.) **On the Equilibrium Diagram of Titanium-Oxygen-Carbon System. II. The Titanium-Oxygen System.** H. Nishimura and H. Kimura. *Japan Institute of Metals, Journal,* v. 20, Sept. 1956, p. 524-528. (CMA)

The Ti-O system was studied by X-ray, microscopy and measuring the melting point. Emphasis was placed on the oxygen-rich portions of the diagram. The liquidus temperature of TiO (δ) phase decreases to 1750° C. as the oxygen content mounts. On the side of Ti_2O_3 (ε) the liquidus temperature again rises to a peritectic point at 1810° C. Solid solubility ranges of the δ and ε phases are discussed. Between ε and η (TiO_2) there occurs a eutectic reaction at 1680° C. and 36.5% O. 7 ref. (M24c; Ti)

51-M. (Japanese.) **On the Equilibrium Diagram of Titanium-Oxygen-Carbon System. III. On the Titanium-Carbon System.** H. Nishimura and H. Kimura. *Japan Institute of Metals, Journal,* v. 20, Sept. 1956, p. 528-531. (CMA)

The carbon-rich portion of the Ti-C phase diagram was emphasized in a study of the whole range of contents. The liquidus rises from the titanium melting point (1660° C.). When the carbon content exceeds 20% the liquidus again falls to a eutectic at 3050° C. and 26% C. Further increases of carbon increase the liquidus to 3800° C., at which point an equilibrium between vapor and graphite vs. liquid occurs. (M24b; Ti)

52-M. (Japanese.) **On the Equilibrium Diagram of Titanium Carbon Oxygen System. IV.** H. Nishimura and H. Kimura. *Japan Institute of Metals, Journal,* v. 20, Oct. 1956, p. 589-592. (CMA)

The Ti-O-C diagram was studied by melting point measurement, chemical analysis, X-ray and microscopy. Solid phases occurring are α-Ti, β-Ti, carbon, δ(TiC-TiO), ε and η. β-phase is produced on the titanium-rich side by a peritectic reaction: Liquid $+ \delta + \alpha \rightleftarrows \beta$. δ is a continuous solid solution of TiC and TiO of NaCl-type structure. Three invariant reactions containing gaseous phases are believed to exist at 3000, 1800 and 1670° C. 4 ref.
(M24c; Ti)

53-M. (Russian.) **Relationship of Composition, Temperature and Heat Stability. III. Quinternary System Alloys Nickel-Chromium-Tungsten-Aluminum-Titanium.** I. I. Kornilov and F. M. Titev. *Izvestiya Akademii Nauk SSSR Otdelentive Nauk,* No. 10, Oct. 1956, p. 117-122.

Relationship of composition, structure and heat stability of alloys of quinternary system nickel-chromium-tungsten-aluminum-titanium alloys in the temperature range from 600 to 1250°. All of the alloys had the same chromium, tungsten and aluminum content (20%, 6% and 4.5% respectively), while the titanium content varied with the nickel, from 0 to 10.0% (by weight). Smelting was conducted in a high-frequency laboratory furnace.
(M24d, Q general, 2-12, 2-10; Ni)

54-M. (Russian.) **Concerning the Phase Composition of the System Boron-Carbon.** V. A. Epel'baum, M. A. Gurevion and B. F. Ormont. *Zhurnal Neorganicheskoy Khimii,* v. 1, Sept. 1956, p. 2149-2154.

Results of investigations dealing with phase relationships within the system boron-carbon. Results are of importance in connection with the manufacture of boron carbide. (M24e; B, NM-a35)

55-M. The Equilibrium Diagram of the System Copper-Germanium. J. Reynolds and W. Hume-Rothery. *Institute of Metals, Journal,* v. 85, Dec. 1956, p. 119-127.

The equilibrium diagram in the region 22 to 100 at. % germanium. The equilibrium diagrams of copper-germanium and copper-silicon are compared. 16 ref. (M24b; Cu, Ge)

56-M. Pseudo-Subgrain Structures on Aluminium Surfaces. N. C. Welsh. *Institute of Metals, Journal,* v. 85, Dec. 1956, p. 129-135.

High-purity annealed aluminum was electrolyzed under conditions ranging from electropolishing to heavy anodic oxidation. Electron-microscope study. (M27c; Al)

57-M. Identification of Inclusions. F. B. Pickering. *Iron and Steel,* v. 30, Jan. 1957, p. 3-9.

Iron-oxygen melts were deoxidized with varied amounts of manganese, aluminum, silicon and titanium. Appearance under normal and polarized light and reaction to various etching reagents was observed. 15 ref. (M27, D11h; ST, 9-19)

58-M. Dislocation Etch Pits in Silicon Crystals. F. L. Vogel, Jr., and Clarence Lovell. *Journal of Applied Physics,* v. 27, Dec. 1956, p. 1413-1415.

Method for etching dislocations in silicon crystals; dislocations in various alloys observed: low angle boundaries, slip lines, polygonization and bent crystal distribution. (M26b, M20g; Si)

59-M. Solubility of Boron in Fe_3C and Variation of Saturation Magnetization, Curie Temperature and Lattice Parameter of Fe_3 (C, B) With Composition. M. E. Nicholson. *Journal of Metals,* v. 9, Jan. 1957, p. 1-6.

Based on magnetic data, it is proposed that an electron transfer occurs between the interstitial atoms and the 3d shell of iron. 17 ref. (M25, P16, Fe, 14-18)

60-M. Aluminum-Magnesium Equilibrium Diagram. J. B. Clark and N. Rhines. *Journal of Metals,* v. 9, Jan. 1957, p. 6-7.

Annealed diffusion couple of pure aluminum and magnesium used to study diffusion layer formation. 6 ref. (M24b, N1; Al, Mg)

61-M. Uranium-Silicon Alloys. A. Kaufmann, B. Cullity and G. Bitsianes. *Journal of Metals,* v. 9, Jan. 1957, p. 23-27.

Description of work done in 1944 on uranium-silicon phase diagram and discussion of properties of an intermediate phase, called ε, whose formula is approximately U_3Si. 6 ref. (M24b; U, Si)

62-M. Structure of the Transition Phase Omega in Ti-Cr Alloys. A. E. Austin and J. R. Doig. *Journal of Metals,* v. 9, Jan. 1957, p. 27-30. (CMA)

In order to better understand the mechanism of diffusion-controlled ω-formation, the structure and orientation relations with the parent β-phase were studied by aging treatments and X-ray diffraction of Ti-Cr alloys. Age hardening in these alloys proceeds through the stages ω precipitation with (100) directions parallel to the original β phase, concurrent alloy enrichment of residual β causing directional strains, and further hardening caused by the strains. 9 ref. (N7a; Ti, *Cr*)

63-M. Twinning in Indium Antimonide. Peter Haasen. *Journal of Metals,* v. 9, Jan. 1957, p. 30-32.

Study of twin boundary planes in InSb and discussion of other types of interfaces which can bound a twin. 8 ref. (M27f; In, *Sb*)

64-M. Investigation of the Effects of Solutes on the Grain Boundary Stress Relaxation Phenomenon. S. Weinig and E. S. Machlin. *Journal of Metals,* v. 9, Jan. 1957, p. 32-41.

Investigation was carried out on copper binary alloys with nickel, silicon, aluminum and silver comprising the range 0.03 to 1 at. % solute. Two stress relaxation peaks of grain boundary origin were ascertained and studied. 12 ref. (M27f; Cu, *Ni, Si, Al, Ag*)

65-M. X-Ray Satellite Line Structure of Ferrite for CrK Radiation. V. Weiss and E. P. Klier. *Journal of Metals,* v. 9, Jan. 1957, p. 41-43.

Study of diffraction lines resulting from satellite emission spectral lines. 3 ref. (M22g, M26q; Fe)

66-M. Solid Solubility of Carbon in Chromium. W. H. Smith. *Journal of Metals,* v. 9, Jan. 1957, p. 47-49.

Microscopic examination of the as-quenched alloys for the presence of a second phase was used as a measure of the solubility limit. Chromium-carbon phase diagram. 5 ref. (M24b, N12p; Cr, C)

67-M. Effects of Aluminum on the Cold-Rolled Textures of Titanium. C. J. Sparks, Jr., C. J. McHargus and J. P. Hammond. *Journal of Metals,* v. 9, Jan. 1957, p. 49. (CMA)

Titanium containing 3.8% Al develops a (0001) (1010) texture instead of that usual in pure titanium. The change from the tilted to the nontilted (0001) position is gradual, with added aluminum decreasing the degree of tilt. Adding 0.27% Al decreased the transverse spread of the basal poles. Pole figures are shown. (M26c; Ti, *Al*)

68-M. Unusual Twinning in Annealed Copper. R. L. Segall. *Journal of Metals,* v. 9, Jan. 1957, p. 50.

An unusual thermal etch figure in copper is described and an explanation in terms of twinning suggested. (M27e; Cu)

69-M. Uranium-Zinc System. P. Chiotti, H. H. Klepfer and K. J. Gill. *Journal of Metals,* v. 9, Jan. 1957, p. 51-57.

Phase fields existing in the uranium-zinc system at 1 and at 5 atm. pressure were determined from X-ray, metallographic, thermal and vapor pressure data. The solid solubility of zinc in uranium is very low and was beyond detection by experimental methods used. 13 ref. (M24b; U, Zn)

70-M. Sigma-Phase in Certain Ternary Systems With Vanadium. J. B. Darby, Jr., and P. A. Beck. *Journal of Metals,* v. 9, Jan. 1957, p. 69-72. (CMA)

Sigma-phase boundaries were studied by microscopy and X-ray in the ternary systems of vanadium with iron and nickel, cobalt or manganese, with nickel and manganese or cobalt, and with cobalt and manganese. The sigma-phase always appears as a long narrow field, connecting the binary sigma phases. The field is narrower in the V-Mn-Ni system than in the V-Mn and V-Ni systems. This is true of the V-Ni-Co system, in which the concavity of the phase boundary toward low vanadium contents stems from coexistence with a second, stable phase. Isothermal sections at 1000° and 1200° C. are shown. (M24c; V)

71-M. Constitution of Nickel-Rich Quinary Alloys in the System Ni-Fe-Cr-Ti-Al. A. Taylor. *Journal of Metals,* v. 9, Jan. 1957, p. 72-75. (CMA)

In a study of the Ni-Fe-Cr-Ti-Al system attention was given the 750 and 1000° C. isothermals of the section Ni_3Cr-Ni_3Ti-Ni_3Fe-Ni_3Al. The phases involved are the f.c.c. primary γ solid solution, the f.c.c. Berthollide γ-phase based on Ni_3Al, and the h.c.p. Daltonide, η-Ni_3Ti. The η and γ fields remain unchanged with increases in temperature but the γ field increases. Ternary diagrams are shown. 3 ref. (M24d; Ni, *Fe, Cr, Ti, Al*)

72-M. Preliminary Investigation of the Ti-Ce System. J. L. Taylor. *Journal of Metals,* v. 9, Jan. 1957, p. 94-96. (CMA)

A study of the Ti-Ce system included X-ray diffraction, microscopy, incipient melting and construction of cooling curves. The peritectoid-type phase diagram includes no intermetallic compounds up to 50 wt. % Ce and a liquid miscibility gap is indicated. Cerium solubility is less than 1% near the peritectoid temperature and decreases to 0.19% at 750° C. An anomaly in the cooling curve with 9.2% Ce showed a latent heat effect between 1300-1350° C. 5 ref. (M24b; Ti, *Ce*)

73-M. Metallography of Aluminum Powder Extrusions. F. V. Lenel, G. S. Ansell, and E. C. Nelson. *Journal of Metals,* v. 9, Jan. 1957, p. 117-124.

Metallographic investigation of experimental and commercial sintered aluminum-powder extrusions using a high-resolution replication technique for electron microscopy. 6 ref. (M27, M21e; Al, 6-22)

74-M. Uranium-Bismuth System. R. J. Teitel. *Journal of Metals,* v. 9, Jan. 1957, p. 131-136.

Crystallographic data reported for three intermetallic compounds: UBi_2, which decomposes peritectically at 1010° C; U_3Bi_4, which decomposes peritectically at approximately 1150° C; and UBi, which decomposes to two liquid phases at a temperature between 1400 and 1450° C. Little solid solubility for either component in the other was indicated. More study needed on high-temperature reaction. 11 ref. (M24b; U, Bi)

75-M. Phase Diagram and Vapor Pressure in the Systems NaCl-$ZrCl_4$, KCl-$ZrCl_4$, and NaCl-KCl(1:1 Molar)-$ZrCl_4$. L. J. Howell, R. C. Sommer and H. H. Kellogg. *Journal of Metals,* v. 9, Jan. 1957, p. 193-200. (CMA)

Portions of the diagrams of KCl and/or NaCl with $ZrCl_4$ were determined. The studies indicated two types of melt that are promising electrolytes for zirconium electrodeposition: melts near the $ZrCl_4$-rich eutectic, and those in the region of the NaCl-rich eutectic. The former has the lowest melting point in the systems studied. Another paper (to be published) is cited which reports that the electrical conductivity is adequate for electrolysis. The high concentration of $ZrCl_4$ permits the rapid transfer of zirconium ions to the cathode by diffusion.
(M24d, P12c, C13n; Zr)

76-M. The Study of Fracture Surface Markings. C. F. Tipper. *Journal of the Iron and Steel Institute,* v. 185, Jan. 1957, p. 4-9.

Investigation of a fractured plate from an oil-storage tank to relate macrostructure with microstructure. 8ref. (M27, M28; ST, 9-22)

77-M. The Formation of Carbides in Low-Carbon, Chromium-Vanadium Steels at 700° C. S. W. K. Shaw and A. G. Quarrell. *Journal of the Iron and Steel Institute,* v. 185, Jan. 1957, p. 10-22.

Carbides were extracted from steels containing 0.2% C, with up to 12% Cr and 2% V and examined by X-ray and chemical analyses to establish the constitution of the carbide phase at 700° C. and to study the approach to equilibrium. 8 ref.
(M26r; AY, SS, *Cr, V*)

78-M. (German.) **The Occurrence of a Cubic Nitride in Aluminum Alloyed Steels.** Walter Koch, Christal Ilschner-Gensch and Helga Rohde. *Archiv für das Eisenhüttenwesen,* v. 27, Nov. 1956, p. 701-706.

Nitrided low-carbon steels were analyzed microscopically and the nitrogen distribution was determined micro-analytically for different layers. Precipitates were isolated electrolytically and analyzed by X-ray, micro-analysis, microscope and electron microscope. The cubic nitride was identified by selected area diffraction. 8 ref.
(M21, M22; AY, *Al,* 14-18)

79-M. (German.) **Inclusion Experiments on Synthetic Mullite. Part I.** Günther Gelsdorff and Hans-Ernst Schwiete. *Archiv für das Eisenhüttenwesen,* v. 27, Dec. 1956, p. 807-811.

Synthetic mullite was made from purest alkali-free materials and the X-ray indices were determined. By means of X-ray it was found that up to 6% Al_2O_3, 3% Fe_2O_3 and 1.5% TiO_2 can be included into the mullite lattice. Only iron oxide and titanium oxide cause a lattice expansion. 17 ref. (M26r; RM-h)

80-M. (German.) **Gold Under the Electron Microscope.** E. Brueche and H. Poppa. *Metall,* v. 11, Jan. 1957, p. 18-21.

Electron microscope photographs of gold surfaces with explanations of the markings. 4 ref.
(M27, M21e; Au)

81-M. (German.) **Texture and Ear Formation of Pure Aluminum Sheets From Continuously and Discontinuously Cast Ingots.** F. Haessner, G. Masing and H. P. Stuewe. *Zeitschrift fur Metallkunde,* v. 47, Dec. 1956, p. 743-750.

The texture of aluminum sheet rolled from continuously and discontinuously cast ingots of different pretreatment was determined and their relations to position and height of earing investigated. The different recrystallization behavior was found to be caused by different content of precipitate. Results are discussed and compared with other publications. 26 ref. (M26c; Al, 4-3)

82-M. (German.) **The System Copper-Silver-Cadmium II.** Erich Gebhardt and Guenter Petzow. *Zeitschrift für Metallkunde,* v. 47, Dec. 1956, p. 759.

In continuation of previous work, especially melting-equilibria and four-phase-reactions are investigated in the ternary system copper-silver-cadmium. Temperature-concentration-sections with constant silver- and copper-concentration of 5% for each as well as isothermal sections at 600, 500 and 300° mediate a picture of the shape of the phase-spaces. Altogether ten four-phase-reactions are stated.
(M24c; Cu, Ci, Cd)

83-M. The Crystal Structure of the P Phase, Mo-Ni-Cr. II. Refinement of Parameters and Discussion of Atomic Coordination. D. P. Shoemaker, C. B. Shoemaker and F. C. Wilson. *Acta Crystallographica,* v. 10, Jan. 10, 1957, p. 1-14. (CMA)

Lattice constants and positional parameters were refined for the crystal structure of the P phase, Mo-Ni-Cr. The lattice constants of the orthorhombic crystal are a = 9.07Å, b = 16.983Å and c = 4.752Å. The unit cell contains 56 atoms.
(M26p; Mo, Ni, Cr)

84-M. The Influence of Tellurium and Lead on the Occurrence of Some Abnormal Formations of Graphite in Gray Cast Irons, and Their Effect on the Mechanical Properties. G. E. Morton. *British Cast Iron Research Association, Journal of Research and Development,* v. 6, Dec. 1956, p. 436-443.

An examination of five commercially produced castings which failed before or during service. The abnormal forms of graphite studied in this paper are: (1) mesh, (2) "spiky" and (3) "Widmanstatten". 4 ref. (M27; CI-n)

85-M. The Use of Diamond Abrasives in Metallographic Polishing. L. E. Samuels. *Industrial Diamond Review,* v. 16, Dec. 1956, p. 233-236.

Advantages of diamond abrasives include high rate of polishing, good quality polishing, and retention of nonmetallic inclusions.
(M20p; NM-k 37)

86-M. The Cold-Rolled Texture of Hafnium. D. S. Eppelsheimer and D. S. Gould. *Institute of Metals, Journal,* v. 85, Dec. 1956, p. 158-160. (CMA)

Arc-melted 3% Zr hafnium alloy was reduced 95% in gage by cold rolling. The preferred orientation of the strip was studied by X-ray diffraction. The texture is similar to other hcp metals and can be said to be (0001) (1010) rotated 25° about the rolling direction. Pole figures are shown. 11 ref. (M26c; Hf, *Zr*)

87-M. X-Ray Study of the Change in Cu_3Au Near 600° C. B. Borie and B. E. Warren. *Journal of Applied Physics,* v. 27, Dec. 1956, p. 1562-1563.

Physical properties and X-ray measurements of the lattice parameters of quenched specimens.
(M26; Cu, *Au*)

88-M. Crystal Structure of Barium and Europium at 293, 78, and 5° K. *Journal of Chemical Physics,* v. 25, Dec. 1956, p. 1123-1124.

X-ray diffraction study.
(M27n, M22g; Ba, Eu)

89-M. General Electric's Research Metallographic Laboratory. J. B. Newkirk and A. S. Holik. *Metal Progress,* v. 71, Feb. 1957. p. 78-81.

A group of eight microscopists and four diffraction experts, occupying an efficient layout of 3000 sq. ft., serve the 450 research workers in the General Electric Research Laboratory, examining and reporting on about 520 specimens monthly.
(M20, M21, M22, M23, 1-2)

90-M. Development of Metallurgical Microscopy. J. C. Wright. *Metal Treatment and Drop Forging,* v. 24, Jan. 1957, p. 15-20.

Development of normal light microscopes and of special instruments such as phase contact, polarized light, X-ray, and electron microscopes. Closely linked techniques of metallographic polishing, etching, and photographing considered. 40 ref. (M21, M20)

91-M. Phase-Diagram Study of Alloys in the Iron-Chromium-Molybdenum-Nickel System. C. J. Bechtoldt and H. C. Vacher. *National Bureau of Standards, Journal of Research,* v. 58, Jan. 1957, p. 7-19. (CMA)

Alloys of 70-80% iron, with chromium, molybdenum and nickel contents varying from 0, 30 and 20%, respectively, were studied. Five hard, intermetallic, stable, coexisting phases have been identified, and all contain molybdenum. Quenching treatments are described. Isothermal sections, photomicrographs and X-ray data. 29 ref.
(M24d; Fe, *Cr, Mo, Ni*)

92-M. The Metallographic View. XXX. Nitriding the Higher Alloy Steels. Howard E. Boyer. *Steel Processing,* v. 43, Jan. 1957, p. 36-37, 45.

Metallographic and hardness study of nitrided Type 410 stainless and hot work toolsteel.
(M27, Q29n, J28k; SS, TS-k)

93-M. (English.) **Electron Diffraction Study on Thin Alloy Films of Aluminum-Silver System.** Denjiro Watanabe. *Physical Society of Japan, Journal,* v. 11, Oct. 1956, p. 1072-1078.

Electron diffraction study of the evaporated alloy consisting mainly of hexagonal close-packed phase and cubic beta-phase.
(M26p; Al, Ag, 14-12)

94-M. Constitution Diagram of the Antimony-Zirconium Alloy System. R. F. Russi, Jr., and H. A. Wilhelm. *U.S. Atomic Energy Commission, ISC-204,* Aug. 1951, 46 p. (CMA)

Sb-Zr alloys made from a master alloy of 23.6% Sb were used to study phase equilibria in the Sb-Zr system. Adding antimony to zirconium raises the α-β transformation and promotes a peritectoid transformation. β-Zr solid solution extends to 14% Sb and 1430° C. Anti-

mony is 2.5% soluble in α-Zr. Higher percentages of antimony increasingly harden and embrittle zirconium. The additions also increased corrosion resistance in 315° C. water.
(M24b; Sb, Zr)

95-M. Crystal Structures of Transition Metal Silicides. C. H. Dauben. *U.S. Atomic Energy Commission, UCRL-3602,* Oct. 1956, 8 p. (CMA)

Structural data are given for the following transition metal silicides: $TiSi_2$, $ZrSi_2$, $CrSi_2$, VSi_2, $CbSi_2$, $TaSi_2$, $MoSi_2$, WSi_2, ZrSi, CrSi, Zr_3Si_2, Ti_5Si_3, Zr_5Si_3, V_5Si_3, Cb_5Si_3, Ta_5Si_3, Cr_5Si_3, Mo_5Si_3, W_5S_3i, Nb_5Si_3, Ta_5Si_3, Zr_2Si, Ta_2Si, V_3Si, Cr_3Si, Mo_3Si and $Ta_{4.5}Si$. Data presented include the ideal structure type of the compounds, space groups and lattice constants. 34 ref.
(M26r; Ti, Zr, Cr, V, Cb, Ta, Mo, W)

96-M. (English.) **A Microscope Study of Etched Germanium Surfaces.** Makoto Kikuchi and Seiichi Denda. *Physical Society of Japan, Journal,* v. 11, Oct. 1956, p. 1127.

Composition of etching solutions and structure of pits.
(M27a, M20q; Ge)

97-M. (German.) **The Origin of the Small Angle Scattering of X-Rays in Plastically Deformed Metals.** S. Seeger. *Acta Metallurgia,* v. 5, Jan. 1957, p. 24.

New small angle scattering concept; the small angle scattering responds to local changes in density in the irradiated sample. 11 ref.
(M22g, Q24)

98-M. (Japanese.) **On the Determination of Austenite Grain Size of Steel by the Oxidation Method.** Yoshiaki Masuko and Tatsuro Onitake. *Sumitomo Metals,* v. 8, Oct. 1956, p. 236-254.

Comparison with other methods for determining austenite grain size for many kinds of carbon steels and low-alloy steels. "Heat etching" method for checking the inhibiting effect of oxidation upon grain growth discussed. 14 ref.
(M27c, 1-4; CN, AY)

99-M. (Russian.) **Methods of Investigating the Structure of Metals and Alloys During High-Temperature Heating Under Vacuum.** M. G. Lozinsky. *Termicheskaya Obrabotka i Svoystva Litoy Stali,* Moscow, 1955, p. 322-356.

Equipment and methodology used. The installation, containing a built-in vertical microscope, was designed and tested at the Institute of Machine Sciene, Academy of Sciences, USSR. A thorough description, complete with photographs and line drawings, of the equipment and its operation is presented.
(M21, 1-2, 1-23, 2-12)

100-M. (Russian.) **Chemical Interaction of Titanium With Other Elements.** I. I. Kornilov and P. B. Budberg. *Uspekhi Khimii,* v. 25, Dec. 1956, p. 1474-1501. (CMA)

Existing literature data on binary systems is surveyed. As a general rule, the character of the interactions between components (formation of solid solutions, formation of chemical compounds with metallic bonds) is determined by the degree of closeness of the components in the periodic system, or, more specifically, by the closeness of atomic radii or of the lattice patterns (metals forming a continuous series of solid solutions are closest; metals forming several compounds are more or less distant). Four types of binary systems are distinguished: 1) Systems showing continuous solid solutions for both modifications of titanium (α and β); zirconium and hafnium are the elements that form such systems with titanium. 2) Systems with continuous solid solutions for β-titanium only; vanadium, columbium and tantalum belong to this group. 3) Systems with limited solid solutions for both modifications of titanium, and with an entectoid transformation; chromium, tungsten, manganese, iron and nickel belong to this type. 4) Systems with limited solid solutions for both modifications of titanium and with a peritectic (or peritectoid) transformation; nitrogen, oxygen, carbon, tin and aluminium belong here. Numerous phase diagrams are given. 90 ref.
(M24b; Ti)

101-M. Structure of Mercury at Low Temperature. C. S. Barrett. *Acta Crystallographica,* v. 10, Jan. 10, 1957, p. 58-60.

The rhombohedral structure of mercury is retained on cooling to 5° K., and the transformation detected by Bridgman at pressure of 10,000 atmospheres and above does not extend to atmospheric pressure. A polycrystalline sample cold worked at 5° K. and run at 5, 78 and 206° K. showed similar diffraction patterns at each temperature, with no evidence of transformation. 14 ref.
(M26n, 2-13; Hg)

102-M. Metal Oxide Solid Solutions. Part I. Lattice Constant and Phase Relationships in Ferrous Oxide (Wustite) and in Solid Solutions of Ferrous Oxide and Manganous Oxide. P. K. Foster and A. J. E. Welch. *Faraday Society, Transactions,* v. 52, Dec. 1956, p. 1626-1635.

Determination of lattice constants for ferrous oxide (wustite) at 1000° C. over the composition range in which this nonstoichiometric phase is stable. 13 ref. (M26r; Fe, 14-17)

103-M. Influence of Impurities on the Recrystallization Texture of Cold-Rolled 3% Silicon Iron. J. D. Fast. *Philips Research Reports,* v. 11, Dec. 1956, p. 490-491.

A procedure invented by Goss to produce polycrystalline silicon-iron sheet wherein the component crystals are oriented such that one of their directions of easiest magnetizations is nearly parallel to the direction of cold rolling, A study of the mechanism is reported.
(M26c, 3-19; Fe, *Si*)

104-M. Lattice Constants and Brillouin Zone Overlap in Dilute Magnesium Alloys. F. W. von Batchelder and R. F. Raeuchle. *Physical Review,* v. 105, Jan. 1957, p. 59-61.

The lattice constants of primary solid solutions of indium, aluminum and cadmium in magnesium as a function of composition. The linearity of the (c/a) vs. concentration curve for magnesium-aluminum has suggested that electron zone overlap does not necessarily lead to axial ratio anomalies and that changes in short-range order may be needed to explain such anomalies.
(M26p; Mg, *In, Al, Cd*)

105-M. The Interaction of Solutes With Dislocation Walls. W. W. Webb. *Acta Metallurgica,* v. 5, Feb. 1957, p. 89-96.

Calculation of the elastic interaction of solutes with dislocation walls has indicated that atmospheres of excess solute atoms may form at small-angle grain boundaries but are subject to saturation effects accompanied by a distinctive temperature dependence. Comparison is made with some available experimental data. (M26b)

106-M. Engineering Properties. V. Composition in Simple Binary Alloys. L. M. Elijah and D. J. Mack. *Engineering Journal,* v. 40, Feb. 1957, p. 141-143.

Investigations were made to show qualitatively how engineering properties vary with gross composition in mechanical mixture alloy systems. Results obtained were discussed for the zinc-lead system and tin-lead system.
(M26b, Q general; Zn, Sn, Pb)

107-M. Where New X-Ray Techniques Solve Old Shop Problems. *Iron Age,* v. 179, Feb. 14, 1957, p. 119-121.

Diffractometer records directly both intensity and angular diffraction of X-rays permitting quantitive analysis of phases present. Detection of stresses in hardened steel and determination of orientation. Instrument with slight modification can be used for determining chemical composition. (M22g, Q25, S11p)

108-M. The Structure, Deformation, and Fracture of Pearlite. Part II. Deformation and Structure. K. E. Puttick. *Iron and Steel Institute, Journal,* v. 185, Feb. 1957, p. 167-176.

Results of a study of plastic deformation and fracture of pearlitic steel by optical and electron microscopy. Techniques developed for the purpose include (a) a two-stage replica process for electron microscopy, using Perspex as the intermediate material and evaporated carbon as the final film, suitable for reproducing rough surfaces, including fracture surface, and (b) photogrammetry of stereoscopic pairs. 21 ref.
(M27d, Q26, M21e, M23c; ST)

109-M. Electron Microscopy of Aluminum Crystals Deformed at Various Temperatures. T. S. Noggle and J. S. Koehler. *Journal of Applied Physics,* v. 28, Jan. 1957, p. 53-62.

Deformation of 99.994% pure aluminum single crystals at 4.2, 78 and 295° K. (M26n, M21e; Al, 14-11)

110-M. Magnetic Structure in Copper-Manganese Alloys. David Menechetti and S. S. Sidhu. *Physical Review,* v. 105, Jan. 1, 1957, p. 130-135.

A neutron diffraction study of a series of substitutional solid solutions up to 85 at. % manganese in copper at about 13 at. % manganese; a broad intensity maximum appears in the region (100) reflection of the face-centered cubic pattern of copper.
(M27g, M22j; Cu, Mn)

111-M. Surface Structures and Ferromagnetic Domain Sizes. D. H. Martin. *Physical Society Proceedings, Section B,* v. 70, Jan. 1957, p. 77-84.

Studies of the domain structures in the surface layers of crystals of

iron and silicon-iron having (111) and (hol) type faces have permitted calculations to be made of the optimum domain sizes in iron crystals as dependent on the crystallographic orientations of their faces and their sizes. 7 ref. (M27g, Fe, Si)

112-M. Changes in Domain Structure Accompanying Reduction in Depth of a Single Crystal of Silicon Iron. L. F. Bates and H. Hart. *Proceedings of the Physical Society,* v. 69B, Dec. 1, 1956, p. 1200-1204.

Bitter patterns reveal marked changes in the domain structure of a Néel—cut crystal of silicon-iron when the crystal dimension perpendicular to a (110) plane is sufficiently reduced and suggest the formation of a new structure with an energy comparable with that of the normal Néel type. 7 ref. (M27g; Si, Fe, 14-11)

113-M. Solid Solution in the GaSb-InSb System. J. C. Woolley, B. A. Smith and D. G. Lees. *Proceedings of the Physical Society, Section B,* v. 9, Dec. 1, 1956, p. 1339-1343.

X-ray measurement to determine line intensity versus Bragg angle and lattice parameter at several annealing temperatures. 7 ref. (M24d, M22g)

114-M. (German.) **Relationship Between Nuclear Physics and Metallography.** Berta Karlik. *Berg und Hüttenmännische Monatshefte,* v. 101, Nov. 1956, p. 210-213.

Construction of nuclear reactors; application of metallography in nuclear reactor technology; construction of nuclear reactors, disintegration products of metals caused by nuclear radiation. (M general, W11, P18h)

115-M. (German.) **Neutron Diffraction.** Karl Lintner. *Berg und Hüttenmännische Monatshefte,* v. 101, Nov. 1956, p. 238-246.

Special application to ferromagnetic and diamagnetic materials discussed and examples given. 23 ref. (M22j; SGA-n)

116-M. (Italian.) **Structure and Properties of Metals. Part III. Alloys.** R. Fieschi and M. Tosi. *Ingegneria Meccanica,* vol. 5, Sept. 1956, p. 5-8.

On the basis of preceding discussion of ideal and real metals, substitutional and interstitial alloys are now considered, with particular reference to steels. (M26p)

117-M. (Italian.) **Structure and Properties of Metals. Part II. Real Metals.** R. Fieschi and M. Tosi. *Ingegneria Meccanica,* v. 5, August 1956, p. 57-62.

Principal differences between ideal solids and real solids. Among imperfections present in real solids, particular consideration is given to dislocations and their importance to an understanding of the mechanical properties of metals. (M26b)

118-M. On the Sulfides, Selenides and Tellurides of Palladium. Fredrik Gronvold and Erling Rost. *Acta Chemica Scandinavica,* v. 10, no. 10, 1956, p. 1620-1634.

The phase relationships in the system palladium-sulphur, palladium-selenium and palladium-tellurium studied by means of X-rays. Density determinations and magnetic susceptibility measurements were also done. 25 ref. (M24b, P10a, P16, 1-3; Pd)

119-M. X-Ray Diffraction Effects of Atomic Size in Alloys. Bernard Borie. *Acta Crystallographica,* v. 10, Part 2, 1957, p. 89-96.

To treat the effect of the difference in size of the atoms in a disordered binary alloy, the elastic model of Huang is modified to treat the two kinds of atoms as two different kinds of distortion centers in an average lattice. (M25, M22g)

120-M. The Crystal Structure of Antimony Selenide, Sb_2Se_3. N. W. Tideswell, F. H. Kruse and J. D. McCullough. *Acta Crystallographica,* v. 10, part 2, 1957, p. 99-102.

The isomorphism of antimony selenide (Sb_2Se_3) with antimony sulphide (Sb_2S_3) has been confirmed through a redetermination and refinement of the structure of antimony selenide. (M26q; Sb, Se)

121-M. The Structure of α(V-Al). P. J. Brown. *Acta Crystallographica,* v. 10, Feb. 10, 1957, p. 133-135. (CMA)

An aluminum-rich compound in the vanadium-aluminum system was shown to be isomorphous with $Mg_3Cr_2Al_{18}$. Each vanadium atom is surrounded by 12 aluminum atoms to form a nearly regular icosahedron. The icosahedra are linked together in the (110) direction, sharing aluminum atoms. There are 16 vanadium and 16 aluminum atoms per cell; the parameter a = 14.492 Å. (M26q; V, Al)

122-M. The Constitution of Titanium-Rich Alloys of Titanium, Aluminum, and Oxygen. T. H. Schofield and A. E. Bacon. *Institute of Metals, Journal,* v. 85, Jan. 1957, p. 194-195. (CMA)

A phase study of titanium alloys with an aluminum content up to 7.5% and oxygen up to 1% was conducted by microscopy methods up to 1250° C. Boundaries are more closely bracketed than in previous work and the (alpha + beta) beta boundary was determined at higher aluminum contents. The combination of oxygen and aluminum stabilizes α to higher temperatures than the sum of the two separately. The form of "transformed beta" depends on oxygen content and quench severity. (M24c; Ti, *Al, O*)

123-M. Thermodynamic Investigation of Nonmetallic Inclusions in Steel —II. Behavior of Titanium, Zirconium and Vanadium Nitrides and Carbides; and Their Effect on Austenite Grain Size of Steel. H. Sawamura and T. Mori. *Kyoto University, Faculty of Engineering, Memoirs,* v. 18, Oct. 1956, p. 402-413. (CMA)

Thermodynamic calculations were made for the formation of titanium, vanadium and zirconium nitride and carbide inclusions in steel. The inclusions do not effectively refine the grain size of austenite unless they are below a critical size. Vanadium and titanium inclusions are more stable than those of zirconium. Inclusions formed in molten steel are larger, and thus less effective, than those formed in solid steel.
(M27c, P12, 9-19; ST, *Ti, Zr, V*)

124-M. The Microstructural Appearance and Identification of Hydrides in Zirconium and Zircaloy-2. Hydrogen Alloys. G. B. Wadsworth, M. L. Picklesimer and G. M. Adamson, Jr. *U.S. Atomic Energy Commission,* TID-7526 (Pt. 1), Feb. 1957, p. 186-208. (CMA)

The hydride phase in zirconium and Zircaloy-2 may be located and identified by anodizing the polished and etched surface in a buffered bath to give a film of ZrO_2 showing intereference colors. Hydrides appear yellow while the matrix is purple to blue. A mercury quenched specimen retained much hydrogen in supersaturation. Details of the procedure are described.
(M27d, 1-4; Zr, *H*)

125-M. (Hungarian.) Some Observations on Aluminum-Titanium-Vanadium Alloys. Robert K. Vassel. *Kohászati Lapok,* v. 11, no. 11-12, 1956, p. 527-528. (CMA)

Single-phase aluminum-titanium-vanadium alloys seem even more promising in the high-temperature range than the usual titanium-base alloys. It has yet to be determined what the effect of an increase of the aluminum content from the usual 5-7% to the metallographically permissible 25-30% (limit of the single-phase field) would entail. 10 ref. (M24c; Al, Ti, V, 2-12)

126-M. Thermodynamic Investigation of Nonmetallic Inclusions in Steel —I. Behavior of Aluminum, Silicon and Iron Nitrides and Their Effect on Austenite Grain Size of Steel. Hiroshi Sawamura and Teshisoda Mori. *Kyoto University, Memoirs of the Faculty,* v. 18, Oct. 1956, p. 378-401.

Investigations of the change of content and the state of nonmetallic inclusions in steel which influence its mechanical properties, especially its austenite grain size. Only the indigenous inclusions were taken into consideration. 40 ref.
(M27c, P12; AY, 9-19)

127-M. Tabulation, Bibliography, and Structure of Binary Intermetallic Compounds. I. Compounds of Lithium, Sodium, Potassium, and Rubidium. S. G. Epstein, D. M. Bailey, R. L. Smythe, G. R. Kilp and J. F. Smith. Iowa State College. *U.S. Atomic Energy Commission,* ISC-795. Sept. 1, 1956, 31 p.

The material is separated into three sections. The first part consists of a tabulation and includes the crystal class, lattice parameters, and Strukturbericht structure symbol or space group symmetry if the data have been reported. The second part of the compilation is the list of references, and the third part is a summary of structure details. The structure details include the space group symmetry, the number of atoms per unit cell, the atomic coordinates, and a list of compounds assigned to the structure.
(M26, M25m; Li, Na, K, Rb)

128-M. A Macroetch for Uranium. R. B. Russel. Paper from "Tenth Metallographic Group Meeting", Oct. 24, 1956. *U.S. Atomic Energy Commission,* TID-7523 (Pt. 1), Dec. 1956, p. 7-13.

The procedure is based on the fact that uranium dissolves rapidly in concentrated hydrochloric acid and that this acid corrodes uranium grains at very different rates which

depend markedly on the kind of crystallographic face of the grain exposed to attack. By using such an acid, grains, and even twin bands within them, may be made clearly visible to the naked eye or with low magnifications. (M20q, M28g; U)

129-M. New Etching Methods for Thorium. David Peterson and Donald Westlake. Paper from "Tenth Metallographic Group Meeting", Oct. 24, 1955. *U.S. Atomic Energy Commission,* TID-7523 (Pt. 1), Dec. 1956, p. 15-21.

An etching procedure for thorium metal has not been completely developed. However, formic acid solutions of hydrogen chloride and hydrogen iodide seem to be very promising. The use of potentially explosive mixtures is avoided, obliteration of inclusions seems to be reduced, and extraneous pitting of the samples seems more easily controlled. (M20q; Th)

130-M. Inclusion Counting Methods for Uranium. C. L. Angerman, S. J. Broderich, R. F. Dickerson, A. E. Guay, L. A. Hartcorn and N. C. Kloepper. Paper from "Tenth Metallographic Group Meeting", Oct. 24, 1955. *U.S. Atomic Energy Commission,* TID-7523 (Pt. 1), Dec. 1956, p. 23-34.

Method for rating the inclusion content should provide information as to the identity and the concentration of the individual inclusions. With uranium, this is best accomplished by a micro method which (a) will give the identity, concentration, and length of the stringers of inclusions, and (b) will give the concentration of the other inclusions not aligned in stringers (i.e., background). Due to the large numbers of inclusions that are usually found in reactor grade uranium, this micro method would be laborious and time consuming. Therefore, a macro method would be useful as a relatively fast means of rating the total inclusion content of a sample neglecting the identification of the inclusions. (M27, 1-4; U, 9-19)

131-M. Metallographic Determination of Uranium-Niobium Phase Diagram up to 10% Niobium. A. E. Dwight. Paper from "Tenth Metallographic Group Meeting", Oct. 24, 1955. *U.S. Atomic Energy Commission,* TID-7523 (Pt. 1), Dec. 1956, p. 37-47.

Metallographic examination has determined the eutectoid line and the lower boundaries of the gamma field but has not conclusively established the alpha to beta transformation. Present method is to bracket the boundary of a phase field within increasingly narrow limits of temperature, until eventually a ± 2° bracket is obtained. (M24b; U, Cb)

132-M. Metallography of the Epsilon Phase in the Uranium-Zirconium System. A. N. Holden. Paper from "Tenth Metallographic Group Meeting", Oct. 24, 1956. *U.S. Atomic Energy Commission,* TID-7523 (Pt. 1), Dec. 1956, p. 49-64.

Various techniques used to study the uranium-zirconium system, and the important part played by metallography. (M24b, 1-4; U, Zr)

133-M. A Preliminary Report on the Uranium-Carbon System. B. Blumenthal. Paper from "Tenth Metallographic Group Meeting", Oct. 24, 1955. *U.S. Atomic Energy Commission,* TID-7523 (Pt. 1), Dec. 1956, p. 65-66.

The investigation is concerned with the system at low carbon concentrations. The liquation experiments resulted in a liquidus curve at lower carbon concentrations than the saturation experiments. (M24b; U, C)

134-M. Metallography for the Geneva Reactor Fuel Elements. R. J. Gray. Paper from "Tenth Metallographic Group Meeting", Oct. 24, 1955. *U.S. Atomic Energy Commission,* TID-7523 (Pt 1), Dec. 1956, p. 67-73.

Metallographic work concerned in the development of fuel elements. A major problem which was encountered in the fabrication of the elements is also discussed, and some photographs and photomicrographs are presented which illustrate the difficulties encountered.
(M general, T11g)

135-M. Techniques for the Metallography of High-Purity Aluminium. T. K. Roche. Paper from "Tenth Metallographic Group Meeting", Oct. 24, 1955. *U.S. Atomic Energy Commission,* TID-7523 (Pt. 1), Dec. 1956, p. 91-98.

Basically, the three techniques that are being used for the metallographic work are: (1) electropolishing; (2) anodization; and (3) the use of etch pits. Electropolishing and anodizing the specimens followed by examination under bright-field illumination permit the determination of such things as the amount of deformed material, the degree of re-

crystallization, and the grain size of the recrystallized material in the extruded bars. The use of etch pits affords some idea of the preferred orientation developed in the bars. The mechanics and results of each technique are described.
(M20p, M20q; Al-a)

136-M. Constitution of Uranium and the Platinum Metals. J. J. Park and R. W. Buzzard. Paper from "Metallurgical Information Meeting, Ames Laboratory", May 1956. *U.S. Atomic Energy Commission,* TID-7526 (Pt. 1), Feb. 1957, p. 89-102.

Progress of the investigations of the constitution of uranium and the platinum metals (Ru, Rh, Pd, Os, Ir, and Pt). The solubilities of these and other transition metals in uranium are compared on the basis of radii, electronegativity, and comparable electronic structures of the ions. (M24b, M25, P15; U, EG-c)

137-M. Preferred Orientation in Extruded Thorium Rod. L. K. Jetter and C. J. McHargue. Paper from "Metallurgical Information Meeting, Ames Laboratory", May 1956. *U.S. Atomic Energy Commission,* TID-7526 (Pt. 1), Feb. 1957, p. 150-164.

Complete fiber axis distributions have been determined for thorium rods extruded at rates from 1 to 600 ft. per min. at 850° C. and for these rods annealed at 750° C. The mechanical properties were determined and a correlation between properties and texture was established. (M26c, Q general; Th, 4-8)

138-M. The Microstructural Appearance and Identification of Hydrides in Zirconium and Zircaloy-2 Hydrogen Alloys. G. B. Wadsworth, M. L. Picklesimer and G. M. Adamson, Jr. Paper from "Metallurgical Information Meeting, Ames Laboratory", May 1956. *U.S. Atomic Energy Commission,* TID-7526 (Pt. 1), Feb. 1957, p. 186-208.

A procedure for the positive identification and location of hydrides in crystal bar zirconium and Zircaloy-2 has been found. The hydride identification technique has been applied to specimens used for mechanical property determinations and radiation damage evaluations.
(M27d, S19; Zr, 14-18)

139-M. (Italian.) **Structure and Properties of Metals. Part I. Theory of Ideal Metals.** R. Fieschi and M. Tosi. *Ingegneria Meccanica,* v. 5, July 1956, p. 49-55.

With properties of atoms and interatomic forces as starting point, character of ideal solids is studied. Theory of electronic bands in solids permits explanation of electrical and thermal properties of matter and differences between conductors and insulators. (To be continued.)
(M25, P15)

140-M. (Russian.) **Investigation of the System Zirconium-Tantalum.** V. S. Emel'yanov, Yu. G. Godin and A. I. Evstyukhin. *Atomnaya energiya,* v. 2, no. 1, Jan. 1957, p. 42-47. (CMA)

Alloy samples were prepared from iodide zirconium and 99% pure tantalum by melting in an electric-arc furnace in an argon atmosphere. The diagram of the system zirconium-tantalum belongs to the eutectic type with restricted solid solution fields. The eutectic forms at 34 at. % Ta and 1585° C. There exists also a eutectoid transformation beta →alpha + gamma at 7 at. % Ta and 790° C., alpha, beta and gamma being solid solutions based, respectively, on alpha-Zr, beta-Zr and tantalum. The maximum solubility of tantalum in beta-zirconium at the eutectic temperature is 16 at. %, while the maximum solubility of zirconium in tantalum at the same temperature is 17 at. %. The maximum solubility of tantalum in alpha-zirconium at the eutectoid temperature is less than 0.22 at. %. 9 ref.
(M24b, Zr, Ta)

141-M. Note on the Effect of Additions of Manganese and Chromium on the Microstructure of D.T.D. 687A-Type Alloys. M. K. B. Day. *Institute of Metals Journal,* v. 24, Feb. 1957, p. 263-264.

Examines microstructures of slowly cooled aluminum alloys. Melts of basic composition Zn 5.75, Mg 2.5, Cu 1.25, Fe 0.2, Si 0.2% with small quantities of manganese or chromium added and determined boundary of primary aluminum phase field. Approximate limits on chromium, manganese and iron content to avoid formation of brittle segregates.
(M27b, 1-10; Al, *Mn, Cr*)

142-M. Preferred Orientation in Extruded Uranium Rod. L. K. Jetter and C. J. McHargue. *Journal of Metals,* v. 9, Feb. 1957, p. 291-292.

Results of study on the texture of uranium rod. Extruded at 500° C., deformation is duplex, components being near <031> and 10° from <410>. Deformation of rod extruded at 500° C. and annealed at

550° C. is also duplex, one component being near <431> and the other being 13° from <100> and 17° from <410>. 7 ref.
(M26c; U, 4-8)

143-M. X-Ray Microscopy of As-Grown and Deformed Single Crystals of Aluminum. J. H. Auld, R. A. Coyle, A. M. Marshall and N. A. McKinnon. *Journal of Metals,* v. 9; *AIME Transactions,* v. 209, Mar. 1957, p. 360-361.

Brief note tells of detection of primary slip bands and kink bands by X-ray micrograph of aluminum crystal. (M21f; Al, 14-11)

144-M. Non-Destructive Method for Assessing Fracture Quality. Dr. H. Kessler and H. Winterstein. *Light Metals,* v. 20, Feb. 1957, p. 64-65.

Errors in evaluation of structural properties of aluminum casting alloys by microscopic examination and conclusions on fracture structure drawn from macrostructure revealed by etching. (M28, M20q; Al, 5)

145-M. (Italian.) **A New Etching Method for Color Metallography of Light Alloys Containing Copper.** M. Leoni. *Alluminio,* v. 26, Jan. 1957, p. 5-9.

New grain coloration method permits observation of various phases in specimen, as well as degree of homogeneity of solid solution and reciprocal grain orientation. 11 ref.
(M20q; Al, *Cu)*

146-M. (Book.) **Technical Papers of the Tenth Metallographic Group Meeting Held at Knolls Atomic Power Laboratory Oct. 24, 1955.** H. P. Roth. *U.S. Atomic Energy Commission* TID-7523 (Pt. 1), Dec. 1955, 100 p.

Papers abstracted separately.
(M general)

147-M. (Book.) **Elementary Crystallography.** M. J. Buerger. 528 p. 1956. John Wiley & Sons, Inc., 440 Fourth Ave., New York 16, N. Y. $8.75.

First half of the book is devoted to a rational development of the megascopically observable symmetries of crystals; the second part discusses the internal symmetries of crystals; in the third section the author introduces advanced material on group theory and its applications to symmetry; the space group theory is presented here without the use of extensive mathematics. (M26)

148-M. Microscopical Examination of Metallic Surfaces. J. Nutting. *Discovery,* v. 18, Mar. 1957, p. 112-117.

Purposes, techniques, equipment; progress toward methods capable of revealing the smallest metal aggregate. (M21)

149-M. Measurement of Elongation of Ferrite Grain in Deep Drawing Sheet. Tetsutaro Mitsuhashi and Yuzo Hosoi. *Mechanical Laboratory of Japan, Journal,* v. 2, no. 2, 1956, p. 40-41.

Elongated grain structure of ferrite is of great importance for aluminum-killed deep drawing sheets, but there is no proper method to express the elongation of the grain. Two methods considered are the counting method and the length measuring method.
(M27c, 1-4; ST-c, 4-3)

150-M. Apparatus for X-Ray Diffraction Studies of Metals Under Controlled Stresses at Elevated Temperatures. L. S. Birks. *Norelco Reporter,* v. 4, Jan-Feb. 1957, p. 8-10.

A Geiger-counter X-ray spectrometer was constructed for the dynamic study of phase changes and other phenomena in metals under controlled stress conditions at elevated temperatures. 6 ref.
(M22-g, 1-3, 2-12)

151-M. Liquid Immiscibility in Metal Systems. B. W. Mott. *Philosophical Magazine,* v. 2, 8th Series, Feb. 1957, p. 259-283.

An analysis is made of liquid immiscibility in metal systems. It is shown that the simple Hildebrand rule, which holds for nonpolar liquids, can be modified to apply to metal systems, by the introduction of a new term which allows for the increased energy due to a difference in electronegativity of the components. (M24; 14-10)

152-M. Domain Patterns on Cobalt Crystals. E. O. Hall. *Physical Society, Proceedings,* v. 70, Pt. 2, Feb. 1957, p. 254-256.

A theoretical explanation of the patterns of a simplified domain structure. 7 ref. (M27g; Co)

153-M. (French.) **Diffraction of Electrons by Small Metallic Crystals.** Lucien Lafourcade and Paul Larroque. *Comptes Rendus,* v. 244, Jan. 7, 1957, p. 178-180.

Comparison of the diagrams formed on a single plate by two films of very different thickness prepared with the same metal. Measurements show that the relative displacement of the maxima of

diffraction appears to depend only on the number of atoms contained in the crystal. This displacement is important only for crystals containing no more than several hundred atoms. (M22g, M26)

154-M. (French.) **On the Selective Dissolution of Iron-Chromium-Nickel Alloys.** Henri Hatwell. *Comptes Rendus,* v. 245, Jan. 14, 1957, p. 340-343.

Variation of the speed of anodic dissolution as a function of chromium content. 5 ref.
(M20q, 1-10; Fe, *Cr, Ni*)

155-M. (French.) **Structure of Steel Ingot Molds, New and After Service.** Michel Ferry. *Fonderie,* no. 133, Feb. 1957, p. 55-63.

Analysis from the viewpoint of depth; variations in structure following the region examined; variations in thickness; comparison of structure before and after heat treatment. 7 ref. (M27, W19, 17-7; ST)

156-M. (French.) **Paper on the Study of Macrographic and Micrographic Structures of Gray Cast Iron for Steel Ingot Molds.** L. Beaujard and S. Bechet. *Fonderie,* no. 133, Feb. 1957, p. 80-89.

Pearlite and ferrite in cast iron molds; nonmetallic inclusions; notes that the microstructure is as much influenced by the chemical composition as by the conditions of casting and cooling. 12 ref.
(M27b, M28h, W19, 17-7; CI-n)

157-M. (Russian.) **Some Properties of Zirconium-Columbium Alloys.** Yu. F. Bychkov, An. N. Rozanov and D. M. Skorov. *Atomnaya Energiya,* v. 2, Feb. 1957, p. 146-157. (CMA)

The authors plotted the phase diagram of the system zirconium-columbium. It presents a continuous series of solid solutions involving beta-zirconium and a eutectoid transformation at 560° C. and 12% Cb. The tensile strength relative elongation and hardness of the alloys were determined as a function of their composition, as well as the heat resistance, which was measured by (*a*) the changes of the hardness at temperatures up to 750° C., and (*b*) the amount of oxidation in air at 570 and 650° C. 5 ref.
(M24b, Q general; Zr, Cb)

158-M. **The Crystal Structure of U_2Mo.** E. K. Halteman. *Acta Crystallographica,* v. 10, Mar. 10, 1957, p. 166-169. (CMA)

The crystal structure of the γ' phase in U-Mo (U_2Mo) is of the $MoSi_2$ type, has a tetragonal unit cell and lattice parameters of a = 3.427 Å and c = 9.834 Å. The γ' phase is an ordered state of the body-centered cubic γ phase.
(M26q; U, Mo)

159-M. **The Structure of V_4Al_{23}.** J. F. Smith and A. E. Ray. *Acta Crystallographica,* v. 10, Mar. 10, 1957, p. 169-172. (CMA)

The crystal structure of V_4Al_{23} was shown by X-ray diffraction to have a hexagonal unit cell and parameters of a = 7.692 Å and c = 17.04 Å. The compound occurs in the Al-V system and is structurally related to Co_2Al_5, Fe_3NiAl_{10}, and Mn_3SiAl_9. Layering is pronounced but imperfect and zone boundaries are prominent. The Al-V bond distances are very short.
(M26q; V, Al)

160-M. **Fibre Texture of Drawn Face-Centered Cubic Metal Wires.** P. Dayal. *Indian Institute of Metals, Transactions,* v. 8, 1954-55, p. 261-268.

Face-centered cubic metals, on being drawn into wires, deform by slipping over the (111) planes in the (110) directions. The crystal grains are so arranged that a definite crystallographic orientation lies parallel to the axis of the wire. A critical review of the known deformation textures in the face-centered cubic metal wires and of the relation between the texture and the properties has been made.
(M26c, Q24a; 4-11)

161-M. **Compounds in the Titanium-Rich Region of the Ti-Al System.** E. Ence and H. Margolin. *Journal of Metals,* v. 9, Apr. 1957, p. 484-485. (CMA)

Titanium alloys with more than 12% aluminum were found to be brittle and the c/a ratio of the alpha-phase increases with the aluminum added. The compound Ti_2Al occurs between 20-30% aluminum and 1000-1200° C. Lattice parameters are a = 5.775 Å and c = 4.638 Å, and the structure is isomorphous with Ti_2Sn. Additional complexities have been noted in the region below Ti_2Al. (M26q; Ti, *Al*)

162-M. **Simple Method of Austenite Grain Size Measurement.** Tetsutaro Mitsuhashi and Yuzo Hosoi. *Mechanical Laboratory of Japan, Journal,* v. 2, no. 2, 1956, p. 38-39.

A simple method of austenite grain size measurement in steel,

called the "slide method". In this method, grain size number of specimen is estimated easily in the field of the microscope eye-piece by comparing with the reduced standard grain size diagrams inserted into the front focal plane of the eye-piece. (M27c, 1-4; ST)

163-M. Preferred Orientation in Uniskanned Zirconium. W. V. Cummings and E. N. Kling. *U.S. Atomic Energy Commission,* HW-41772, Mar. 5, 1956, 66 p. (CMA)

The Uniskan process of forming thin-walled tubes is classified as a rolling process, but the shape and action of the rolls and the nature of the applied forces are unique. The preferred orientation of Uniskanned zirconium is important in predicting the performance of the finished product. X-ray diffraction was employed. The thicker walls showed random orientation but the thinner walls developed a preferred orientation quickly, which was about 10° for the angle and 5° for the angle ϕ and 5° for the angle α. X-ray intensity versus percent reduction is plotted. 4 ref. (M26c, F26s; Zr)

164-M. Tabulation, Bibliography, and Structure of Binary Intermetallic Compounds. Pt. II. Compounds of Beryllium, Magnesium and Calcium. K. A. Gschneidner, D. J. Beerntsen, R. W. Vest, J. A. Kingston and J. F. Smith. Iowa State College, *U.S. Atomic Energy Commission,* ISC-812, Dec. 27, 1956, 36 p.

The second of a series of reports on intermetallic compounds. (M26q)

165-M. (English.) **Investigation of Systems of Fused Salts Based on Thorium Fluoride.** V. S. Emelyanor and A. I. Evstyukhin. *Soviet Journal of Atomic Energy,* no. 4, 1956, p. 561-566. (Translated by Consultants Bureau, Inc., 227 17th St., New York, N.Y.)

The system thorium fluoride-sodium chloride-potassium chloride, which is significant in the selection of an electrolyte for the production of thorium by electrolysis, was investigated by thermal and X-ray phase-analytical methods. The salts were melted in an atmosphere of argon and the structural diagrams prepared. 9 ref. (M24d, C23p; Th)

166-M. (German.) **The Metal Science of Titanium Alloys.** M. Hansen. *Berg- und Huettenmaennische Monatshefte,* v. 101, Dec. 1956, p. 285-292. (CMA)

The three main types of phase diagrams of titanium alloys (Ti-Fe, Ti-Mo and Ti-Al types) described. The effects of the presence of oxygen, nitrogen, aluminum and chromium on the meohanical properties of the products are surveyed, and the nature of the phase transformation of solid solutions, due to transformations of alpha and beta titanium, is explained. (M24b, 1-10; Ti)

167-M. (German.) **Phase Diagrams of Titanium-Base Systems.** I. I. Kornilow. *Berg- und Huettenmaennische Monatshefte,* v. 101, Dec. 1956, p. 304-307. (CMA)

A general investigation of the mutual effects of titanium and other elements of the periodic system enabled the classification of binary titanium systems into five typical phase diagrams: (1) systems with continuous solid solutions of alpha and beta Ti; (2) systems with continuous solid solutions of beta Ti and limited solid solutions of alpha Ti; (3) systems with limited solid solutions and having a eutectoid transformation; (4) systems with limited solid solutions and having a peritectoid transformation; and (5) systems which do not form solid solutions. Examples of each type are cited and typical phase diagrams are shown. (M24b; Ti)

168-M. (German.) **Structural Investigations of the Systems Titanium-Gallium and Titanium-Indium.** K. Anderko. *Naturwissenschaften,* v. 44, Feb. 1957, p. 88. (CMA)

An intermediary phase Ti_2Ga was found in the system titanium-gallium crystallizing in the hexagonal system. In the system titanium-indium a phase of the composition Ti_3In, crystallizing with higher indium contents in the cubic system was found. 3 ref. (M24b; Ti, Ga, In)

169-M. (German.) **Ordered Hexagonal Phases in the Systems Titanium-Aluminum and Titanium-Indium.** Kurt Anderko, Konrad Sagel and Ulrich Zwicker. *Zeitschrift für Metallkunde,* v. 48, Feb. 1957, p. 57-58. (CMA)

X-ray investigations on Ti-Al, Ti-In and Ti-Al-In alloys showed the existence of the two ordered hexagonal phases Ti_3Al and Ti_3In. These two phases are isotypic and completely miscible with each other. The occurrence of an ordered α-phase Ti_3Al, isotypic with Ti_2Sn, ex-

plains the continuous mixed crystal formation between the gamma-phase Ti_3Sn and the homogeneous alpha-phase of titanium-aluminum system. Continuous mixed crystal formation may also be expected in the Ti_3In-Ti_3Sn system. 9 ref. (M24; Ti, Al, In)

170-M. (Italian.) **On the Effects of Chemical Etching on Germanium Monocrystals.** G. Della Pergola and D. Sette. *Nuovo Cimento,* Suppl. to v. 4, Series X, no. 2, 1956, p. 1021-1033.

Study conducted on two faces of a germanium monocrystal with (100) and (111) planes; four different etching solutions used. 8 ref. (M20q; Ge)

171-M. Lattice Defects and Plastic Deformation. L. M. Clarebrough. *Australian Institute of Metals, Journal,* v. 1, Oct. 1956, p. 90-110.

Literature review giving some of the current ideas concerning nature of dislocations and role they play in plastic deformation of metals. Materials cited include structure of dislocations including edge and screw types. Evidence from experiments on crystal growth, low angle boundaries and metallic whiskers; part played by dislocation mechanisms in plastic deformation in forming large slip steps, lattice defects and dislocations. 73 ref. (M26s, M26b, Q24)

172-M. Lattice Dynamics of Body-Centered and Face-Centered Cubic Metallic Elements. Pt. III. Cubic Invariant Polynomials. Jules De Launay. *Journal of Chemical Physics,* v. 26, Mar. 1957, p. 663-667.

When the frequencies obtained from the secular equations of lattice dynamics are expressed as power series in the magnitude of the propagation vector, the coefficients of the series terms are polynominals in the direction cosines of the vector. These polynominals are invariant under the symmetry operations of the cube. A number of their properties which have proved to be of value in computations of the lattice spectrum are presented. (M26)

173-M. Epitaxial Growth and Oxidation of Nickel, Cobalt and Iron on Rocksalt. L. E. Collins and O. S. Heavens. *Physical Society Section B, Proceedings,* v. 70, Mar. 1, 1957, p. 265-281.

The structure and orientations of films of iron, nickel and cobalt, deposited by thermal evaporation on rock salt, have been examined by electron diffraction. The oxides, forming spontaneously on the epitaxially grown metal films, have also been examined. The results are considered in the light of current theories of epitaxy and it is shown that the lattice misfit between substrate and deposit materials is generally less important than the maintenance of correct coordination of atoms in the first layer. 22 ref. (M26r; Ni, Co, Fe, 14-12)

174-M. (English.) **Electron Diffraction Study on Polish Layers of Gold. Pt. I.** Masao Kuriyama, Kazutake Kohra and Satio Takagi. *Physical Society of Japan, Journal,* v. 12, Feb. 1957, p. 151-156.

Line breadths were measured at various stages of polishing. The mean grain size and the mean strain were determined using Hall's method for medium polish layers which produce broad ring patterns. The grain size was also determined from electron micrograph and from the number of spots on a spotty diffraction ring obtained from a minute region of the specimen. The values obtained from those different methods agree in order of magnitude with each other. 22 ref. (M22h; Au)

175-M. Etching Technique for Simultaneous Development of Austenite and Pearlite Structures. V. S. Popov. *Henry Brutcher Translation* no. 3891, 1 p. (From *Zavodskaya Laboratoriya,* v. 22, no. 3, 1956, p. 317.) Henry Brutcher, Altadena, Calif.

Currently used technique for etching weld joints. New etching technique permitting simultaneous development of austenitic and pearlitic structures in composite welds, clad steel, etc. (M20q; ST, 7-1)

176-M. (French.) **Radiocrystallographic Study of Hydridation of Cerium; Attempt at Interpretation, Including the Case of Lanthanum.** Claude Ayphassorho. *Comptes Rendus,* v. 244, Mar. 25, 1957, p. 1766-1769. (CMA)

Several writers have observed the size reduction of the elementary lattice cell (face-centered cube) of cerium hydride and lanthanum hydride when the amount of hydrogen absorbed in the system metal-hydrogen increases. This change has been ascribed to the existence of two cubic lattices. The present author, examining the system Ce-H with the aid of the neutron spectro-

graphic method at 350° C. and at room temperature, arrived at the following interpretation (which probably also applies to the system La-H); there exist two cubic lattice varieties; in one of them, having the lattice parameter 5.581 Å and corresponding to composition CeH_2, hydrogen atoms occupy tetrahedral positions, whereas in the second variety, having the parameter 5.540 Å, hydrogen atoms occupy octahedral sites. The observed reduction of the parameter corresponds to the gradual occupation of the octahedral sites. 5 ref.
(M26r; Ce)

177-M. (French.) **Structures and Micrographic Examinations of Special Cast Irons Used in the Construction of Diesel Engines. Pt. 2.** Jean Gonin and Gerard de Smet. *Machine Moderne et Revue Mecanique,* no. 577, Apr. 1957, p. 47-53.

Study of the influence exerted by the introduction of special elements such as nickel and chromium into cast iron; consideration of the structures best suited to produce the qualities demanded of a cast iron used in motor casings.
(M27, 1-10, W11, 17-7; CI)

178-M. (French.) **Study Using Microscope and Electronic Diffraction of Tin-Iron Alloy Films on White Iron.** J. J. Trillat and K. Mihama. *Metaux-Corrosion-Industries,* no. 379, Mar. 1957, p. 102-110.

The microscope brings into evidence the increase in dimensions of the grains when the thickness of the alloy film increases. Electronic diffraction demonstrates the existence of a very thin superficial film of complex composition, which covers the alloy $FeSn_2$; in one particular case the presence at the surface of the alloy Fe_3Sn or Fe_2Sn was detected.
(M27c, M22h; CI-p, Sn, 14-12)

179-M. (German.) **Osmium-Chromium Alloys.** Ernst Raub. *Zeitschrift für Metallkunde,* v. 48, Feb. 1957, p. 53-56.

Different osmium-chromium alloys were investigated by X-rays, microscope and hardness testing. Osmium dissolves 22.6% Cr. At the composition $OsCr_2$ only sigma phase is found, which is stable at high temperature. At the composition $OsCr_3$ the secondary, beta-W phase which is originated at low temperature occurs. Discussion of structure similarities between the alloys of the platinum metals and the high melting metals of the group 6. 8 ref. (M24b; Os, Cr)

180-M. (German.) **Contribution to the Knowledge About the System Gallium-Germanium.** Ninon de Roche. *Zeitschrift für Metallkunde,* v. 48, Feb. 1957, p. 59-60.

Investigation of the phase diagram gallium-germanium by differential thermal analysis. Calculation of the liquidus curve and of the melting entropy of gallium and germanium from the results. 6 ref.
(M24b; Ga, Ge)

181-M. (German.) **Proof of Contaminations and Grain Boundaries by Thermal Etching of Zinc.** Sigmar German. *Zeitschrift für Metallkunde,* v. 48, Feb. 1957, p. 79-80.

Gray residue remaining after thermal etching of zinc is a zinc compound stable at 400° C. and has low vapor pressure. After etching of polycrystalline specimen greater amounts of this residue are found in grain boundaries than in the grains themselves. (M20q, M27f; Zn)

182-M. (German.) **Dilatometer With a Short-Gage Length for Transformation Examination.** Wilhelm Hofmann and Reinhard Müller. *Zeitschrift für Metallkunde,* v. 48, Mar. 1957, p. 104-108.

A self-recording dilatometer with thermocouple measuring tips is used for measurements near the welded seam of steel during the welding process. 3 ref. (M23b, 1-3, K9r)

183-M. (German.) **Three-Dimensional Observations on the Structure of Eutectic Alloys.** Frederick N. Rhines and Walter F. B. Timpe. *Zeitschrift für Metallkunde,* v. 48, Mar. 1957, p. 109-115.

One component was dissolved by selective chemical or electrochemical solution treatment from binary eutectic alloys (aluminum-silicon, silver-silicon, antimony-silicon, sodium-silver, lead-silver), and the remaining component was examined microscopically. 3 ref.
(M20q, M27b; Al, Si, Ag, Sb, Na, Pb)

184-M. (German.) **On the Structural Family of Nickel Arsenic.** Paul Esslinger and Konrad Schubert. *Zeitschrift für Metallkunde,* v. 48, Mar. 1957, p. 126-134.

Tabulation and discussion of compounds of the type T50B50 of T (transition) metals and B elements. 19 ref. (M26q; Ni, As)

185-M. Structures of ZrGe, $HfSi_2$ and $HfGe_2$. J. F. Smith and D. M. Bailey. *Acta Crystallographica,* v. 10, Apr. 10, 1957, p. 341-342. (CMA)

X-ray diffraction of single crystals of $ZrGe_2$, $HfSi_2$ and $HfGe_2$ confirms earlier work on crystal structures. Layer-line symmetry and characteristic extinctions show that all belong in the space group D^{17}_{2h}-Cmcm. The compounds appear to be isostructural. (M26q, M22g; Zr)

186-M. Titanium Metallurgy—Pt. II. Structure of Titanium Deposits Formed in Electrolytic Cells Using Fused Alkali Chloride Baths. R. S. Dean, W. W. Gullett and F. X. McCawley. *Industrial Laboratories,* v. 9, May 1957, p. 10-12. (CMA)

Structure of titanium deposits produced by the electrolytic method of the Chicago Development Corp. The bundles of coarse filamentary particles originally have their interstices filled with salt, which is drained readily. The bundles are not dendritic, except when the cell geometry creates zones of very low cathode current density. Plate thickness and the extent of the fine crystal zone are directly related to the initial cathode current density. The initial cathode plate formed is ductile if formed on a titanium cathode. The formation of the large crystals in the outer zone is due to supersaturation of the zone with sodium. Sodium forms at the rate that titanium from titanium dichloride crystallizes out. The equilibrium is unusual.
(M27d, C23p; Ti)

187-M. Molybdenum-Rhenium System. A. G. Knapton. *Institute of Metals, Bulletin,* v. 3, Mar. 1957, p. 161. (CMA)

Arc-melted molybdenum alloys with up to 100% Re studied from 900° C. to the liquidus. The solubility of rhenium in molybdenum falls from 42 at. % at 2400° C. to 27 at. % at 1000° C. One of the intermediate phases is of the alpha-manganese type and the other is of sigma structure; the previously reported face centered cubic lattice phase at 25 wt. % Re was not confirmed. The sigma-phase, which forms peritectically at 2500° C., is unstable below 1200° C. The other phase forms peritectoidally at 1850° C. from sigma and rhenium-rich solid solution. The maximum solubility of molybdenum in rhenium is 14 at. %. (M24b; Mo, Re)

188-M. Titanium-Aluminum Alloys. *Metal Industry,* v. 90, Apr. 26, 1957, p. 328, 331. (CMA)

It appears that the cost of titanium alloys may be justified in applications where the low density and good creep resistance in the range 300-500° C. are the desirable properties. Aluminum seems to be an essential addition for stress resistance at medium temperatures, due to the alpha-stabilizing nature of the addition. Further investigation of the titanium-aluminum system of alloys shows that increases of aluminum above 10% reduce the hot workability. Anomalous effects in elongation and ductility properties indicate phase changes, but altered microstructures were not detected. A study is cited which notes long-range ordering in alloys containing less than 20% Al. Many anomalies may be explained on the basis of Ti_3Al superlattice formation. Other workers postulate the formation of an $alpha_2$ phase at 7.5% Al from a peritectoid reaction from the alpha-beta phase field. An (epsilon) field at high aluminum contents is also postulated. An inadequate understanding of the titanium-aluminum system is stressed.
(M24b, Q general; Ti, Al)

189-M. Nature of Some Mechanically Polished Metal Surfaces as Evidenced by Epitaxial Phenomena. L. E. Samuels. *Institute of Metals, Journal,* v. 85, Jan. 1957, p. 177-184.

Since the phenomenon of epitaxis might be expected to be sensitive to the presence of thin surface layers, experimental techniques based on it have been used in an endeavor to make a fresh approach to the problem of the existence of a Beilby layer on surfaces polished by mechanical metallographic methods. It is shown that electrodeposits formed on surfaces of copper, alpha-brass, tin, zinc, silver, and iron, and the overgrowths of alkali halides on surfaces of silver, are epitaxed after finish polishing by standard methods. (M26, M20p; 8-12)

190-M. P-T-X Phase Diagrams of the Systems In-As, Ga-As and In-P. J. van den Boomgaard and K. Schol. *Philips Research Reports,* v. 12, Apr. 1957, p. 127-140.

For the compounds indium arsenide, gallium arsenide and indium phosphide, the phase relations solid-liquid-vapor have been determined. Indium arsenide has a maximum

melting point of 943 ± 3° C. at an arsenic pressure of 0.33 atm. Gallium arsenide has a maximum melting point of 1237 ± 3° C. at an arsenic pressure of 0.9 atm. For indium phosphide the maximum melting point is estimated to lie at 1062 ± 7° C. at a phosphorus pressure of approximately 60 atm. 8 ref. (M24d, N12; In, As, Ga)

191-M. (Italian.) **Metallography of Titanium.** D. Gualandi. *Metallurgia Italiana,* v. 49, Mar. 1957, p. 149-158. (CMA)

Principal procedures for obtaining metallographic preparations of titanium and its alloys. These comprise methods of chemical etching and mechanical and electrolytic development of metallographic structures. Micrographs are presented illustrating the allotropic alpha-beta transformation as it is modified by the presence of carbon, hydrogen or oxygen or by the rate of cooling of the titanium samples. 21 ref. (M21, M27b; Ti)

192-M. (Russian.) **X-Ray Study of the Crystal Structure of the Compounds TiSi and TiGe.** N. Ageev and V. Samsonov. *Doklady, Akademiya Nauk S.S.S.R.,* v. 112, Feb. 11, 1957, p. 853-855. (CMA)

Measurements of the structure of TiSi and TiGe, synthesized from elements either by sintering or melting, were made using monocrystals extracted from shrinkage holes in melts. The lattice parameters of the orthorhombic crystals are, for TiSi: a = 3.61 Å, b = 4.96 Å, c = 6.47 Å; for TiGe: a = 3.80 Å, b = 5.22 Å, c = 6.82 Å. The distribution of atoms in the elementary cell, tentatively determined from the intensities of lines on the X-ray interference curve, was checked by comparison with lines on a calculated curve for a statistical distribution of atoms in the cell. 3 ref. (M26q, M22g; Ti, Si, Ge)

193-M. Phase Diagram of the Binary System Titanium-Aluminum. I. I. Kornilov, E. N. Pylaeva and M. A. Volkova. *Academy of Sciences of the U.S.S.R., Bulletin. Division of Chemical Science,* no. 7, July 1956, p. 787-795. (Translated by Consultants Bureau, Inc., 227 W. 17th St., New York 11, N. Y.). (CMA)

Previously abstracted from original. See item 398-M, 1956. (M24, Q29, Ti, Al)

194-M. An Extraction Replica Method for Large Precipitates and Non-Metallic Inclusions in Steels. G. R. Booker, J. Norbury and Richard Thomas. *British Journal of Applied Physics,* v. 8, Mar. 1957, p. 109-113.

A replica method which enables large (up to 10 microns or so) precipitates and inclusions to be extracted from steels. There is no etching through the replica, and consequently weakening and staining of the film are avoided. Examples of the extraction of iron nitride, iron carbide, and nonmetallic inclusions. 11 ref. (M20r; ST, 9-19)

195-M. Constitution of Alloys of Iron and Manganese With Transition Elements of the First Long Period. A. Hellawell and W. Hume-Rothery. *Royal Society of London, Philosophical Transactions,* v. 249, Ser. A, Mar. 14, 1957, p. 417-459.

Constitutions of iron-rich and manganese-rich binary alloys with the sequency of elements titanium-vanadium - chromium - (manganese, iron)-cobalt-nickel-copper were investigated by specially accurate thermal analyses, supplemented by microscopical and X-ray work. The liquidus and solidus curves were determined accurately. 27 ref. (M24d; Fe, Mn)

196-M. (English.) **Crystal Habits of Silicon Crystallized in Al-Si Alloys.** Ichiji Obinata and Noboru Komatsu. *Tohoku University, Science Reports of the Research Institutes,* v. 9-A, Apr. 1957, p. 107-117.

Aluminum alloys with 20% silicon containing none or only one of the following additional elements—sodium, magnesium, zinc, chromium, manganese, copper, cadmium, tin, lead, antimony, bismuth, iron, nickel and cobalt—were cooled very slowly or cast in sand molds. Then, the alloys were electrolyzed in hydrochloric acid solution by using a lead plate as the cathode. Silicon crystals thus obtained as the anode slime were collected and subjected to goniometry, X-ray and chemical analyses. From the above experiments, three types of crystal habits of silicon were detected. (M26m, N12; Al, Si)

197-M. (German.) **Investigations of the Three-Component Systems Molybdenum-Silicon-Boron, Tungsten-Silicon-Boron and in the System VSi_2-$TaSi_2$.** H. Nowotny, E. Dimakopulou and H. Kudielka. *Monatsschrifte für Chemie,* v. 88, no. 2, 1957, p. 180-182. (CMA)

The phase diagram of the three-component system Mo-Si-B at 1600° C. shows mainly a ternary phase $Mo_5(Si,B)_3$ with T2 structure and in equilibrium with molybdenum; Mo_3Si, Mo_5Si_3 (type T1), Mo_2B and MoB. The microhardness of the ternary phase is higher than that of the pure molybdenum silicides and seems even higher than that of the pure molybdenum borides. An isotype crystal structure exists also in the three-component system W-Si-B. Continuous solid solutions were found in the quasi-binary system VSi_2-$TaSi_2$. 17 ref.
(M24c; Mo, Si, B, W, V, Ta)

198-M. (Italian.) **On a New Etching Method for the Color Metallography of Copper-Bearing Light Alloys.** M. Leoni. *Metallurgia Italiana,* v. 49, Mar. 1957, p. 170-172, 180.

The etch produces a thin epitaxial layer which gives rise to colorations in each crystal, which are related to the microstructure. It is possible to show the phases present in a given sample, as well as the degree of homogeneity of the solid solution. 11 ref. (M20q; Cu)

199-M. (Italian.) **Color Micrography as Applied to Common Brasses.** P. Lombardi. *Metallurgia Italiana,* v. 49, Mar. 1957, p. 181-185.

Some color micrographical research related to common brasses and results obtained from examination of selected samples. Color micrography is carried out two different methods: (1) by formation of thin epitaxial films on the sample surface so that the crystal grains will be differently colored; and (2) by deep etching which shows the corrosion surfaces, different for each metal. Color micrography may be recommended only for particular analyses, the most important of which may be orientation of crystalline grains. 7 ref. (M20, M21; Cu-n)

200-M. (Italian.) **Structural Relation and Equilibria Between the Epsilon and Zeta Phases of the Fe-N System.** A. Burdese. *Metallurgia Italiana,* v. 49, Mar. 1957, p. 195-199.

Equilibria between the epsilon and zeta phases of the Fe-N system and the structure of epsilon solids are discussed. 6 ref. (M24b; Fe, N)

201-M. (Italian.) **Single Etching Reagent for the Micrographical Examination of Ferritic, Martensitic and Austenitic (as Well of Sigma-Phase) Stainless Steels and High Speed Steels.** G. Catella and C. Giometto. *Metallurgia Italiana,* v. 49, Mar. 1957, p. 200-205.

A reagent consisting of 1.2% solution of picric acid in ethyl alcohol, 100 cc.; hydrochloric acid, 10 cc.; and glacial acetic acid, 3 cc. was adopted.
(M20q; NM-a 31, SS, TS-m)

202-M. (Italian.) **Contribution to the Study of Nonmetallic Inclusions in Ferrochromium.** R. Zoja. *Metallurgia Italiana,* v. 49, Mar. 1957, p. 206-211.

The morphology of inclusions in refined ferrochromium, and isothermal transformations of inclusions. 5 ref.
(M27; AD-n, Fe, Cr, 9-19)

203-M. **Quenching-In of Lattice Defects in Gold-Cadmium.** M. S. Wechsler. *Acta Metallurgica,* v. 5, Mar. 1957, p. 150-158.

Amount of quenched-in resistivity was measured as a function of quench temperature. Isothermal annealing of the quenched-in-resistivity was studied at a number of temperatures. Possible explanations of defect responsible for changes in resistivity are discussed. 28 ref. (M26s, J26, J23s; Au, Cd)

204-M. **X-Ray Diffraction Studies on Precipitates and Inclusions in Steels Using an Extraction Replica Technique.** G. R. Booker, P. J. Norbury and A. L. Sutton. *British Journal of Applied Physics,* v. 8, Apr. 1957, p. 155-157.

A simple extraction method in which precipitates and inclusions in steels can be isolated for identification by X-ray diffraction. The included material is removed from the metal surface embedded in a thin plastic replica, which is then formed into a small, compact, cylindrical specimen suitable for powder cameras. Scope of the method, examples of its application. 3 ref.
(M22g, 1-3; ST, 9-19)

205-M. **Lattice Spacings of Nickel Solid Solutions.** W. B. Pearson and L. T. Thompson. *Canadian Journal of Physics,* v. 35, Apr. 1957, p. 349-357.

New lattice spacing measurements in terminal nickel solid solutions with Cr, Mn, Co, Zn, Ga, Ge, In and Sn solutes are reported and discussed, and the relationship of lattice distortion and the depression of the solidus temperature is examined in solid solutions of the first long

period elements in nickel. 21 ref. (M26p; Ni)

206-M. Lattice Distortion in Terminal Solid Solutions of the First Long Period Transition Metals and Copper. W. B. Pearson. *Canadian Journal of Physics,* v. 35, Apr. 1957, p. 350-362.

Collected data of the gross lattice distortion in solid solutions of the first long period elements in each other and in copper, together with similar data for B group solutes in copper, silver and gold. It is shown that there is no correlation between the size of the lattice distortion and the solid solubility of the first long period transition metals in copper. 7 ref. (M26p; Cu)

207-M. Lattice Dynamics of Hexagonal Close-Packed Metals. L. J. Slutsky and C. W. Garland. *Journal of Chemical Physics,* v. 26, Apr. 1957, p. 787-793.

Atomic force constants are related to the elastic constants by the method of homogeneous deformation in which the contribution of the electron gas to the elastic constants is assumed to arise from an isotropic volume-dependent term in the energy. Relations are given for the propagation of acoustical waves in hexagonal crystals which permit calculation of the elastic constants from ultrasonic pulse velocity measurements. (M26, Q21)

208-M. Uranium-Lead System. Robert J. Teitel. *Journal of the Institute of Metals,* v. 85, May 1957, p. 409-412.

New data on the solubility of uranium in lead, obtained by filtration technique, and on the crystal structure of UPb, obtained by neutron diffraction. Uranium-lead phase diagram included. (M24b; U, Pb)

209-M. Lattice Parameters of the Alpha Solid Solutions of Copper-Zinc-Germanium and Copper-Zinc-Gallium Alloys. B. B. Argent and D. W. Wakeman. *Journal of the Institute of Metals,* v. 85, May 1957, p. 413-414.

Investigation to determine whether anomalies exist in lattice parameters of ternary systems as have been reported for binary systems. It was found that expansion of copper lattice may be expressed approximately as the sum of the expansion due to each of the solutes considered individually. 11 ref. (M24c, M26; Cu, *Zn, Ge, Ga*)

210-M. Electron Probe Microanalyzer and Its Application to Ferrous Metallurgy. R. Castaing, J. Philibert and C. Crussard. *Journal of Metals,* v. 9, *AIME Transactions,* v. 209, Apr. 1957, p. 389-394.

Apparatus employing electron optical system focuses very fine electron beam on specimen; analyzes X-radiation with curved crystal Geiger-Müller counter vacuum spectrograph. Report on preliminary trials with instrument on segregation of manganese, selective oxidation during scaling, internal oxidation, phases of sulphides occurring in several iron and steel alloys; diffusion studies of uranium-zirconium and iron-copper alloys. 11 ref. (M21e, 1-2, M27, R2q, R2s, N1)

211-M. Central Region of the Magnesium-Zinc Phase Diagram. J. B. Clark and F. N. Rhines. *Journal of Metals,* v. 9, *AIME Transactions,* v. 209, Apr. 1957, p. 425-430.

X-ray diffraction and metallographic study of phase equilibria in the magnesium-zinc phase system from 0 to 85% zinc between 93 and 335° C. Revised diagram indicates magnesium-zinc phase is stable over temperature range studied. Temperature of eutectoid decomposition of Mg_7Zn_3 near 325° C. (M24b; Mg, Zn)

212-M. Electron Diffraction Study of Flake Graphite Extracted From Molten Pig Iron. Kichizo Niwa and Goro Shimaoka. *Journal of Metals,* v. 9, *AIME Transactions,* v. 209, Apr. 1957, p. 430-434.

Study by electron diffraction transmission characteristics of single graphite flakes, segregated from molten carbon or silicon-rich iron at 1200 to 1500 °C. (M22h; CI-a)

213-M. Modern Metallographic Equipment. J. C. Wright. *Metal Treatment and Drop Forging,* v. 24, May 1957, p. 175-180.

Advantages and disadvantages of various techniques and equipment for specimen preparation and examination. (To be continued.) (M10, 1-2)

214-M. X-Ray Investigation of the Deformation and Bond Strength in the Crystal Lattice of Metals and Alloys. G. V. Kurdyumov, V. A. IL'ina, V. K. Kritzkaya and L. I. Lysak. *British Atomic Energy Research Establishment,* AERE Lib/Trans 673, 1957, 16 p. (Translated by J. Adam, Harwell, Berks.)

Measurements of X-ray diffraction line widths and intensities yield fundamental data related to the fine structure of metals and alloys. These are: sizes of coherent scattering domains for X-rays, magnitude of elastic deformation in crystallites, amplitudes of atomic thermal vibrations and static disordered displacements of atoms in the lattice. Based on these methods are studies of phenomena of hardening and softening of metals and alloys. 27 ref. (M22g, M26)

215-M. **Anodizing as a Metallographic Technique for Zirconium Base Alloys.** M. L. Picklesimer. *U.S. Atomic Energy Commission*, ORNL-2296, May 24, 1957. 14 p. (CMA)

Anodizing method used for titanium-base alloys has been modified for phase identification in zirconium alloy systems. Optical contrast of microstructures is thus improved and etched surfaces are preserved. A thin oxide film is formed on the specimen in an electrolytic bath of ethanol, water, phosphoric acid, lactic acid, glycerin and citric acids; voltages vary from 20 to 140 v., depending on the purpose and the color desired. Zirconium hydride needles are identified easily. (M23; Zr)

216-M. **Studies of the Titanium-Aluminum System.** K. Sagel, E. Schulz and W. Zwicker. *Henry Brutcher Translation* No. 3909, 6 p. (From *Zeitschrift für Metallkunde*, v. 47, no. 8, 1956, p. 529-534.) Henry Brutcher, Altadena, Calif.

Previously abstracted from original. See item 392-M, 1956. (M24; Ti, Al)

217-M. **How to Reveal the Microstructure of Non-Etching Surface Layers on Ferrous Metals.** B. A. Krasyuk. *Henry Brutcher Translation* No. 3920, 3 p. (From *Zavodskaya Laboratoriya*, v. 22, no. 5, 1956, p. 556-558.) Henry Brutcher, Altadena, Calif.

Failure of known etchants to bring out the structure of surface layers of ferrous metal parts subjected to metallic impregnation, as chromizing, also to electrosparking and the like; study of causes of this failure, based on determination of electrochemical potentials; proposed change to mounting of specimens for grinding, polishing, and etching. (M20)

218-M. **Rapid Method of Bringing Out the Primary Structure of Welds.** A. A. Rossoshinskii. *Henry Brutcher Translation* No. 3936, 3 p. (From *Zavodskaya Laboratoriya*, v. 22, no. 5, 1956, p. 558-560.) Henry Brutcher, Altadena, Calif.

Previously abstracted from original. See item 296-M. (M21, K1, M27)

219-M. (French.) **Electron Microscope: 60,000 Magnification.** *Journal d'Informations Techniques des Industries de la Fonderie*, no. 83, Dec. 1956-Jan. 1957, p. 17-18.

Research possibilities; application to foundry practice; essential principles underlying its use; methods applied for the examination of metallic samples. (M21e)

220-M. (French.) **Metallographic Atlas of the Types of Microstructure of Copper Alloys.** *Journal d'Informations Techniques des Industries de la Fonderie*, Supplement to no. 83, Dec. 1956-Jan. 1957, 20 p.

Clear reproduction of slides covering bronze, bronze with lead, brass, copper, cupro-aluminum and alloys such as Monel. Preparation of samples; macrographic and micrographic examination after attack by ferric chloride. (M27d, M20; Cu)

221-M. (French.) **Film Mounts and Printing Techniques in Electron Microscopy.** Roger Dargent. *Metaux-Corrosion-Industries*, v. 32, Apr. 1957, p. 135-148.

Observation of transparent objects; types of films (aluminum, carbon, etc.) and methods of preparation; replica technique. (To be continued.) (M20r)

222-M. (German.) **Etching of Gallium Arsenide.** Hans Achim Schell. *Zeitschrift für Metallkunde*, v. 48, Apr. 1957, p. 158-161.

Description of a new etching technique. 6 ref. (M20q; Ga, As, 14-18)

223-M. (German.) **Metallographic Preparation of Noble Metals by Electropolishing.** Gerhard Reinacher. *Zeitschrift für Metallkunde*, v. 48, Apr. 1957, p. 162-170.

An apparatus for electrolytic lapping for use on metals which cannot be easily polished anodically. The method works with homogeneous as well as heterogeneous alloys. The advantages of the technique are shown, using noble metals as examples. 46 ref. (M20p, 1-3; EG-c)

224-M. (German.) **Structure of NiAs Type Crystals. Pt. II. Meaning of Structure Correlation Based on Outer Electrons.** Konrad Schubert and Paul

Esslinger. *Zeitschrift für Metallkunde,* v. 48, Apr. 1957, p. 193-200.

A special correlation of the outer electrons in nickel arsenide type crystals is proposed which leads to a better understanding of some aspects of this structure. 21 ref. (M26q; Ni, As)

225-M. Crystal Structure of the Metallic Phase Mg_{32} (Al, Zn)49. Gunner Bergman, John L. T. Waugh and Linus Pauling. *Acta Crystallographica,* v. 10, Apr. 10, 1957, p. 254-259.

A complete determination of the crystal structure of the ternary phase (lambda or T phase) in the magnesium-aluminum-zinc system with composition approximately $Mg_3Zn_3Al_2$ has been carried out with use of intensity data from single-crystal Weissenberg photographs. The refinement of the structural parameters was carried out by use of Fourier projections, followed by application of the method of least squares. 20 ref. (M26q; Mg, Al, Zn)

226-M. Potentialities of X-Ray Diffraction Studies in Non-Destructive Testing. J. R. Rait and H. S. Peiser. *British Journal of Applied Physics,* Supplement No. 6, Physics of Non-Destructive Testing 1957, p. S13-S17.

Limitations of X-ray diffraction tests. Five groups are useful: fluorescent spectrometry; diffractrometric phase analysis; X-ray measurements of orientation textures; determination of lattice parameters which depend on solid-solution, temperature and strain effects; and determinations of line profiles related to crystal size and perfection. 7 ref. (M22g)

227-M. Variation in Lattice Constant in Thin Films of Gold. S. N. Chatterjee. *Indian Journal of Physics,* v. 31, Feb. 1957, p. 110-116.

Lattice constants of gold for films of different thicknesses (3-120 Å) were determined by the electron diffraction technique. It was found that for thin films of gold (1-10 Å) the lattice constant increases by about 5% over the value of the constant for films (40-120 Å) thick. 11 ref. (M26; Au, 14-12)

228-M. X-Ray Determination of Conjugate Deformation Twins in Copper. F. A. Sherrill, M. C. Wittels and T. H. Blewitt. *Journal of Applied Physics,* v. 28, May 1957, p. 526-529.

The unambiguous determination of the twin relationships is accomplished by a unique X-ray technique which makes use of a single crystal adapter and Geiger counter methods. The adapter permits the detection and measurement of weakly diffracting reflections, and the twin relationships are established by the unique application of geometrical data in a stereographic projection. (M26c, M22g; Cu)

229-M. X-Ray Study of Order in the Alloy $CuAu_3$. B. W. Batterman. *Journal of Applied Physics,* v. 28, May 1957, p. 556-561.

Measurements of the integrated intensity of the superstructure reflections 100 and 110 from powders and a single crystal of $CuAu_3$ give a long-range order parameter $S = 0.87 \pm 0.04$ for a temperature below T_c not well defined. At the composition $CuAu_3$, $T_c = 199°$ C. With decreasing Au content, T_c increases. Compositions richer in Au than $CuAu_3$ could not be ordered. (M26, M22g; Cu, Au)

230-M. Electronic Distinction Between Metals and Nonmetals. R. T. Sanderson. *Journal of Chemical Education,* v. 34, May 1957, p. 229.

With the single exception of hydrogen, all elements are metals if the number of electrons in the outermost shell of their atoms is equal to or less than the period number of the element (which is the same as the principal quantum number of that shell). (M25)

231-M. Metallographic View. Pt. 33. Metallography of Tool Steels. Water and Oil-Hardening Types. Howard E. Boyer. *Steel Processing and Conversion,* v. 43, Apr. 1957, p. 205-206.

Note on the microstructure of three toolsteels hardened and tempered; one brine-quenched, the other oil-quenched. (M27, J26; TS)

232-M. (Czech.) **Possibilities of Using Electron-Emission Microscopy in the Investigation of Metal Structures.** Bohdan Sestak. *Hutnické Listy,* v. 12, Mar. 1957, p. 202-215.

Describes an adaptor for a table electron microscope of Czech origin by means of which the electron microscope can be used in thermo-emission. By means of thermo-emission the influence of the deformation of a surface layer formed during mechanical grinding and polishing was examined; growth of the austenitic grain and the relation to temperature and time were observed. The

microscope can be used in the examination of the structures of current carbon steels in the temperature range from 750 to 900° C.
(M21e, 1-3, M27, N3; CN)

233-M. (French.) **Influence of Very Small Percentages of Foreign Atoms on the Structure of the Iron-Oxide Interface of Iron.** Raymond Sifferlen and Claude Bourelier. *Comptes Rendus,* v. 244, Apr. 15, 1957, p. 2160-2163.

Interface irregularities are directly related to segregation of foreign atoms and imperfections in network structure in vicinity of interface. 4 ref. (M26r; Fe)

234-M. Twin Intersections in Titanium. F. D. Rosi. *Acta Metallurgica,* v. 5, June 1957 p. 337-339. (CMA)

Four types of twin intersections were observed in a number of coarse-grained alpha-titanium specimens. In one type, one twin acts as an impenetrable barrier to the other and there is a marked difference between the twins regarding thickness. In the second type, the path of the crossing twin is deflected by the crossed twin and suffers a stepped discontinuity. In the third type, one of the twins is displaced and continues anew on the opposite side of the other twin. In the fourth type, one twin appears to pass through the other, apparently splitting it; neither is displaced. (M27e; Ti)

235-M. New Method of Preparing Thin Metallic Films for Electron Microscopy. Noboru Takahashi, Kan-Ichi Ashinuma and Masaru Watanabe. *Journal of Electron Microscopy,* v. 5, (Annual Edition) 1957, p. 22-27.

An apparatus for preparing thin metallic films was constructed on the basis of a new method of melting. These films show the metallographic features similar to that of industrial metallic materials with the corresponding electron diffraction patterns when examined by a three-stage electron microscope. Examples for metals and alloys such as Al, Al-Ag, Al-Zn, Pb-Sn, etc., are given. (M20s, M21e)

236-M. Remeasurement of Liquidus Temperatures of Mg-Ba Alloys. K. P. Anderko. *Journal of Metals,* v. 9, *AIME Transactions,* v. 209, Apr. 1957, p. 612.

Note giving liquidus temperatures of magnesium-barium alloys in the 6 to 27 at. % barium range. 3 ref. (M24b, Mg, Ba)

237-M. Magnetic Analogy of a Dislocation. A. G. Guy and L. G. Criswell. *Metal Progress,* v. 71, June 1957, p. 82-84.

Two rows of equally spaced magnets, the upper one swung like a pendulum, form a physical model which illustrates that the force necessary to cause slip in a perfect crystal is much greater than in a crystal containing dislocations.
(M26b, Q24a, 17-6)

238-M. Metallographic View. Pt. 34. Metallography of Tool Steels. Higher Alloy Types. Howard E. Boyer. *Steel Processing and Conversion,* v. 43, May 1957, p. 267-268.

Note on microstructures and hardness values for three high-alloy type toolsteels which were air quenched from about 1800° F. and tempered at 900° F. (M27, Q29a, TS)

239-M. Structural Changes in Uranium-12 w/o Molybdenum Alloy During Experimental Fuel Rod Fabrication. J. G. Goodwin. *U.S. Atomic Energy Commission,* WAPD-125, Jan. 26, 1956, 24 p. (CMA)

Zircaloy-2 clad fuel rods of U-12% Mo were produced through steps which included induction melting, consumable electrode arc melting, ingot extrusion, billet extrusion for cladding, cold or hot drawing, cold or hot swaging, annealing and straightening. Grain structure of the alloy changes through these processes shown by micrographs.
(M27c, 3-20, T11g, 17-7; U, *Mo, Zr,* 8-16)

240-M. (French.) **Concentration of Hydrogen in the Lattice of Alpha Iron.** Jacques Plusquellec, Pierre Azou and Paul Bastien. *Comptes Rendus,* v. 244, Feb. 25, 1957, p. 1195-1197.

X-ray diffraction reveals that hydrogen tends to concentrate in lattice defects and permits explanation of phenomena connected with presence of hydrogen in iron. 3 ref.
(M26, N15e; Fe, *H*)

241-M. (French.) **Structure of Certain Chromium Nickel Steels.** Jean Bourrat, Louis Colombier, Joseph Hochmann and Jean Pilibert. *Comptes Rendus,* v. 244, Feb. 25, 1957, p. 1197-1200.

Electronic probe micro-analyzer permits determination of percentages of nickel and chromium in austenitic and ferritic phases.
(M27, M23s; SS, *Ni, Cr*)

242-M. (French.) **Deformations, Ruptures and Dislocations of the Crystal-**

line Structures of Metals. A. Roos. *Génie Civil,* v. 134, May 1, 1957, p. 198-205.

Study of ruptures caused by tensile tests, impact tests and corrosion; deformation caused by strain and cold working. These phenomena can be explained, in certain phases by the "theory of dislocations". (M26b, 9-22)

243--M. (Russian.) **Identity Period of the Lattice of Pure Metallic Vanadium and Changes in This Period Produced by the Presence of Oxygen.** M. A. Surevich and B. F. Ormont. *Fizika Metallov i Metallovedenie,* v. 4, 1957, p. 112-114. (CMA)

The presence of very small amounts of impurities, especially oxygen, renders vanadium brittle. The authors investigated this situation roentgenographically by measuring the identity period of the crystal lattice, in this case the side of the elementary cube of vanadium samples prepared by different methods: spectrally pure vanadium, with only traces of iron, obtained by reduction of V_2O_5 with calcium; 97-98% V, containing aluminum, iron and oxygen, prepared by reducing V_2O_5 alumothermally; 90% V, with 3% Ca and 7% O, prepared by reducing V_2O_5 with calcium. Only the spectrally pure variety was plastic; the others were brittle, the brittleness increasing with the oxygen content. Since it was found that the size of the elementary cell increases regularly with the oxygen content, the X-ray analysis of a given sample can serve as a method for determining that content. This method could perhaps be applied to other metals. 13 ref. (M26n, 3-19; V-a)

244-M. (Book.) **Constitutional Diagrams of Alloys: a Bibliography.** Originally compiled by J. L. Haughton; second edition compiled by A. Prince. 323 p. 1956. Institute of Metals, 4 Grosvenor Gardens, London, S.W. 1. $5.50.

Criterion for including references in the bibliography (paper must contain part or the whole of any equilibrium diagram) remains the same as that used in first edition. Additional references have been inserted and this second edition is brought up to date to the end of 1954. (M24; 11-15)

245-M. (Book.) **Phase Diagrams in Metallurgy. Their Development and Application.** Frederick N. Rhines. 340 p. McGraw-Hill Book Co., Inc., 330 W. 42nd St., New York 36, N.Y. $12.

Presentation is designed to lead the student into the subject gradually, beginning with one-component system, progressing through binary, ternary and quaternary systems, and ending with a brief treatment of pressure-temperature diagrams. (M24)

246-M. Bismuth in Copper Grain Boundaries. C. W. Spencer, R. A. Rummel and F. N. Rhines. *Journal of Metals,* v. 9, *AIME Transactions,* v. 209, June 1957, p. 793-794.

Five cast copper-bismuth alloys containing 4.68, 0.53, 0.043, 0.0064 and 0.0025% Bi were subjected to bend tests and structures of fractured surfaces were compared with those of polished cross sections by metallographic methods. Embrittlement found to be associated with phase in grain boundaries. 5 ref. (M27f; Cu, *Bi*)

247–M. Grain-Boundary Carbides in Extra-Low-Carbon Stainless. R. O. Steiner and P. S. Trozzo. *Metal Progress,* v. 72, July 1957, p. 108-110.

A "sensitizing" heat treatment precipitates complex carbides, $(Fe, Cr)_{23}C_6$, whose locus favors one of the abutting grains.
(M27d, M21e, M22h, 1-4; SS, 14-18)

248-M. Dislocations and Plastic Properties of Metals. J. Philibert. *Metal Progress,* v. 72, July 1957, p. 146-148. (Digest from *Metaux-Corrosion-Industries,* no. 368, Apr. 1956, p. 154-166.)

Previously abstracted from original. See item 226-M, 1956. (M26b, Q21, Q23)

249-M. Stacking Faults in Face-Centered Cubic Metals and Alloys. R. E. Smallman and K. H. Westmacott. *Philosophical Magazine,* v. 2, May 1957, p. 669-693.

Stacking faults on the (111) planes of several face-centered cubic metals and alloys have been introduced by cold work, and estimates of the stacking fault probability, x, have been obtained from changes produced in the Debye-Scherrer spectrum. The faulting probability increases on alloying, from one plane in 300 in copper, to one plane in 25 for some high solute content alloys containing zinc, aluminum, tin or germanium. Both neutron irradiation (5 x 10 n.v.t.) and "quenched-in" vacancies have little significant effect on the faulting parameter. 22 ref. (M26s)

250-M. The Axial Ratio of Zinc, and of the Eta and Epsilon Brasses. F. R.

N. Nabarro. *Philosophical Magazine,* v. 2, May 1957, p. 716-718.

The changes of lattice parameters within either the epsilon or the eta phase can be accounted for only by taking into consideration the effects of the Brillouin zone, and probably other factors. On the other hand, the Brillouin zone effects will not account for the transition from epsilon to a highly prolate structure, although they may modify the behavior of this transition considerably. (M26; Zn, Cu-n)

251-M. On the Relation Between Bond Hybrids and the Metallic Structures. S. L. Altmann, C. A. Coulson and W. Hume-Rothery. *Royal Society, Proceedings,* v. 240, May 21, 1957, p. 145-159.

The failure of existing theories to account for the type of crystal structure of a given metal is emphasized. It is suggested that, particularly when the number of bonding electrons is high, the metallic bond has greater directional characteristics than are generally assumed, and that those can be related to the symmetries of known hybrid bonds. Consideration is given to the face-centered cubic, body-centered cubic and close-packed hexagonal structures of the transition metals, and it is shown that the hybrids suggested by the crystal structures can be correlated with the known electron characteristics of these metals. 19 ref. (M26)

252-M. An Introduction to High Speed Steel. Howard E. Boyer. *Steel Processing,* v. 43, June 1957, p. 324-325, 351.

Compositions of four typical high speed steels; temperature effects from 2000-2350° F. on microstructure. (M27, 2-12; TS-m)

253-M. Part of the Five-Component System Nickel-Chromium-Tungsten-Titanium-Aluminum. I. I. Kornilov, L. I. Pryakhina and O. V. Ozhimkova. *Academy of Sciences of the USSR, Bulletin, Division of Chemical Science,* no. 8, Aug. 1956, p. 907-909. (Columbia Technical Translations.) (CMA)

Previously abstracted from the original. See item 473-M, 1956. (M24, Q general, Ni, Al, Ti, W, Cr)

254-M. (French.) **Study of Lanthanum-Aluminum Alloys.** Francoise Guame-Mahn and Micheline Cohen. *Centre National de la Recherche Scientifique, Journal des Recherches,* v. 38, Mar. 1957, p. 64-71. (CMA)

Compounds in the system La-Al were prepared both by the fusion of the metals and by treating aluminum with lanthanum fluoride and reducing with calcium. The formation of the compounds La_4Al_2, LaAl, $LaAl_2$ and $LaAl_4$ was confirmed. Their density increases with the lanthanum content. $LaAl_4$ has two phases with a transition point at 816° C.; $LaAl_4$ alone is diamagnetic. In another series of experiments the end of the phase diagram representing alloys with low lanthanum contents (0.1-5%) was investigated. It was found that the solubility of lanthanum in aluminum is low, not exceeding 0.25% La and that the mechanical properties of aluminum are not appreciably improved by the addition of lanthanum. This is evidently due to the large difference in atomic radii of aluminum and the cerium group of rare earths. Possibly rare earths of higher atomic weights, for which this difference is smaller, will be found to be more effective agents in improving the properties of aluminum. 12 ref. (M24b, Q general, 2-10; Al, *La*)

255-M. (French.) **Film Mounts and Printing Techniques in Electron Microscopy. Pt. II.** Roger Dargent. *Métaux–Corrosion-Industries,* v. 32, May 1957, p. 191-200.

Replica techniques; formvar prints; methods of single and double prints; aluminum-carbon and formvar-carbon prints; operating procedures. (To be contiued.) (M20r)

256-M. (French.) **Nondestructive Macrographic Examination of Annealing on Mild Steel Welds.** H. Granjon. *Soudage et Techniques Connexes,* v. 11, May-June 1957, p. 189-193.

Method for macrographic etching on the outside of fusion welded assemblies, applicable more particularly to liquefied gas cylinders, renders it possible to check to what extent the normalizing treatment is efficiently performed. Comparison with the data given by the macrographic examination of sections and micrographic inspection. (M28p; CN, 7-1)

257-M. (German.) **Preparation of Metallographic Etchings of Copper Alloys Through "Overcutting" With Mikrotom and Electrolytic Polishing.** G. Reinacher. *Metall,* v. 11, July 1957, p. 593-598.

"Overcutting" with a cutting blade (Mikrotom) and electrolytic polishing are used independently or in

combination, eliminating other grinding and polishing operations. This results in considerably improved clarity of etching of copper and copper alloys and in timesaving in the preparation of specimens. Demonstrated on copper with Cu_2O inclusions, on brass of different contents, on bronze and copper-beryllium alloys. 11 ref. (M20; Cu)

258-M. (German.) **Morphology of Surfaces of V2A Steel Polished by the Use of Gases.** E. Brüche and K. J. Schulze. *Metalloberfläche,* v. 11, June 1957, p. 181-189.

The optimal polishing point of V2A steel (18% chromium, 9.5% nickel, 0.1% carbon, more than 0.4% titanium and the remainder iron) lies at 50° C. in gas consisting of NO_2:HCl:H_2O = 30:60:10 molar ratio. Extensive details are given with ternary diagrams and electron microscopic photographs. 3 ref. (M20p; SS)

259-M. (German.) **Contribution to the Knowledge of the System Cerium-Aluminum.** Jan H. N. van Vucht. *Zeitschrift für Metallkunde,* v. 48, May 1957, p. 253. (CMA)

Earlier investigators claimed the existence of Ce_3Al_2 in the cerium-rich phase of the binary system Ce-Al, but no Ce_3Al or Ce_2Al. In the present investigation of the Ce-Al system in the range above 50 at.% Ce, using X-ray diffraction, thermo-analytic and microscopic methods, two modifications of Ce_3Al were observed: a hexagonal Ni_3Sn structure below 230° C. and a cubic Cu_3Au structure above that temperature. The presence of Ce_2Al or Ce_3Al_2 could not be confirmed. 8 ref. (M24b; Ce, Al)

260-M. (Russian.) **Study of the Phase Diagram of the System Zirconium-Boron. Pt. I.** V. A. Epelbaum and M. A. Gurevich. *Zhurnal Fizicheskoi Khimii,* v. 31, Mar. 1957, p. 708-711. (CMA)

In the zirconium-boron phase diagram the high-zirconium region with predominating zirconium was investigated chemically and roentgenographically. The solid solution of boron in α-Zr has a limit at about 2 at.% B, the parameters of the hexagonal lattice changing from a = 3.232 A, c = 5.140 A to a = 3.253 A, c = 5.191 A. These findings disagree with data of Post and Glaser, who report for the higher limit of c the much larger value c = 5.57 A. 7 ref. (M24b; Zr, B)

261-M. Characteristic Temperatures of Cubic Metals. E. E. Budzinski and H. Schiff. *Canadian Journal of Physics,* v. 35, May 1957, p. 507-511.

An approximation is developed for the determination of the characteristic Debye temperature of cubic crystals. 3 ref. (M26)

262-M. Defect Structure and the Temperature Dependence of Hardness of an Intermetallic Compound. J. H. Westbrook. *Journal of the Electrochemical Society,* v. 104, June 1957, p. 369-373.

Silver-magnesium system studied from −190° C. to the solidus temperature over the entire homogeneity range. Results appear to rationalize previously contradictory studies of the effect of defect structure on the room-temperature strength of intermetallic compounds. 35 ref. (M26q; Ag, Mg)

263-M. Observation of Precipitates and Inclusions in Steel by Extraction Replica Technique. Iku Uchiyama, Akira Fukami and Shinjiro Katagiri. *Journal of Electromicroscopy,* v. 5, 1957, p. 28-33.

Some inclusions (oxides, sulphides, etc.) and precipitates (carbides) in steel were observed by extraction replica technique using evaporated carbon film. A new method was used in which sodium chloride crystals were placed on replica film as standards. 7 ref. (M20r; ST, 9-19)

264-M. Effects of Compression and Annealing on the Structure and Electrical Properties of Germanium. E. S. Greiner, P. Breidt, Jr., J. N. Hobstetter and W. C. Ellis. *Journal of Metals,* v. 9; *AIME Transactions,* v. 209, July 1957, Sec. 2, p. 813-818.

Study revealed the operation of the postulated dislocation mechanism of plastic flow. No evidence of recrystallization was found, but a domain structure composed of small-angle boundaries was formed by large deformations at high temperatures. Annealable acceptor centers apparently due to point defects were found and studied. 31 ref. (M27g, P15, 2-14; Ge)

265-M. Further Contribution to the Crystallographic Angles for Bismuth and Antimony. W. Vickers. *Journal of Metals,* v. 9; *AIME Transactions,* v. 209, July 1957, Sec. 2, p. 827-828.

Tables of angles between directions and angles between planes for bis-

muth, which are also applicable to antimony, as its axial angle is only 10′ less than that of bismuth. 3 ref. (M26n; Bi, Sb)

266-M. X-Ray Diffraction Study of the Sigma Phase in the Systems Re-Cr, Ru-Cr, and Os-Cr. R. M. Waterstrat and J. S. Kasper. *Journal of Metals,* v. 9; *AIME Transactions,* v. 209, July 1957, Sec. 2, p. 872-873.

X-ray patterns for the three sigma phases are given. While intensity comparisons may not be extremely good, there is no positive indication of highly ordered atomic distributions. 4 ref.
(M26, M24b; Re, Ru, Os, *Cr*)

267-M. Elevated Temperature Phase Relationships in the Cr-Ni-Mn-N System. E. J. Whittenberger, E. R. Rosenow and D. J. Carney. *Journal of Metals,* v. 9; *AIME Transactions,* v. 209, July 1957, Sec. 2, p. 889-895.

Austenite-austenite plus delta ferrite phase boundaries determined for Cr-Ni-Mn-N system at temperatures of 2100, 2200 and 2300° F. over composition ranges 15 to 21% Cr, 0 to 3% Ni, 12 to 18% Mn, and 0.25 to 0.45% N. Structural diagrams permit selection of ferrite-free stainless compositions containing little or no nickel. 6 ref.
(M24d, N8, 2-12; SS)

268-M. Intermetallic Compounds in Titanium-Hardened Alloys. H. J. Beattie, Jr., and W. C. Hagel. *Journal of Metals,* v. 9; *AIME Transactions,* v. 209, July 1957, p. 911-917. (CMA)

The nickel-chromium alloy A-286, as hardened by titanium, was studied using light and electron microscopy and X-ray and electron diffraction. The phase relations revolve around the tendency of excess nickel to leave the matrix and combine with γ', η and G phases (G-phase is a bulky nickel-titanium silicide, probably $Ni_{16}Ti_6Si_6$, resulting from grain-boundary segregation). Interatomic distances in the G-phase are not short. When the silicon content is negligible, a new phase precipitates instead of the G and Laves phases. 8 ref.
(M26q; Ni, SGA-h, *Ti*)

269-M. Determination of Orientation of Magnesium by Polarized Examination. S. L. Couling and G. W. Pearsall. *Journal of Metals,* v. 9; *AIME Transactions,* v. 209, July 1957, Sec. 2, p. 939-940.

Specimens were etched 6 to 8 sec. in an acetic picral solution. Metallograph used permitted insertion of an adjustable full-wave retardation plate between specimen and polarizer. 4 ref. (M26c, X4a, 1-3; Mg)

270-M. Thermodynamics of the Cu-Fe-S System at Matte Smelting Temperatures. W. A. Krivsky and R. Schuhmann, Jr. *Journal of Metals,* v. 9; *AIME Transactions,* v. 209, July 1957, Sec. 1, p. 981-988.

Sulphur activities were measured as a function of phase compositions in three major regions in the Cu-Fe-S system at temperatures from 1150-1350° C. Data generally confirm previously published phase diagrams for the Cu-Fe-S system in above range and establish more accurately locations of the liquid metal-liquid matte immiscibility region and the terminus of this region with two liquids in equilibrium with the gamma-iron alloy phase. 19 ref.
(M24c, P12; Cu, *Fe, S*)

271-M. Constitution of Delta-Phase Alloys of the System U-Zr-Ti. H. A. Saller, F. A. Rough, A. A. Bauer and J. R. Doig. *Journal of Metals,* v. 9; *AIME Translations,* v. 209, July 1957, Sec. 2, p. 878-881.

At all temperatures investigated, a maximum of two phases was found to exist either metallographically or by X-ray. No evidence found for presence of a three-phase region. Constitution diagram for section, ranging from 74 at. % Zr to 35 at. % Ti, is proposed. 3 ref.
(M24c; U, *Zr, Ti*)

272-M. Occurrence of the Beta-Manganese Structure in Transition Metal Alloys and Some Observations on Chi-Phase Equilibria. H. J. Goldschmidt. *Metallurgia,* v. 56, July 1957, p. 17-26.

New intermetallic compound of beta-manganese structure occurs in the Fe-Cr-W-C system. The phase is stable close to the melting point and is associated with the chi-phase of alpha-manganese structure. 17 ref. (M26q; Mn)

273-M. Overheating Effects in High Strength Aluminum Alloys. T. R. G. Williams. *Metallurgia,* v. 56, July 1957, p. 33-37.

Comparison of microstructures of Al-Cu-Mg-Si alloys overheated at both the homogenization and solution heat treatment stages reveals rosettes of liquated material in both;

liquation films at grain boundaries during preheating, whereas the films are present at the boundaries of the recrystallized grain in solution heat treatment. 4 ref.
(M27f, 2-14; Al, 9-23)

274-M. A New Phase Structure of Molybdenum. P. S. Aggarwal and A. Goswami. *Physical Society, Proceedings,* v. 70, no. 451B, July 1, 1957, p. 708-710. (CMA)

A face-centered cubic structure has been observed in molybdenum deposited in vacuo; heretofore, only the body-centered cubic modification was known. Electron diffraction shows that the deposits formed on rocksalt in about 10 min. were in two-degree (100) and (111) orientations. The pattern showed spots and rings, the hkl values of which were all odd or all even.
(M26n; Mo)

275-M. Phase and Free Energy Relationships in the System Titanium-Zirconium-Oxygen. M. Hoch, P. Walsh and Yao Chiang. *Wright Air Development Center,* Technical Report 56-567. *U. S. Office of Technical Services* PB 121981, Jan. 1957. 32 p. (CMA)

The Ti-Zr-O system is not only of theoretical interest, but is of interest in the study of cermets because of the ZrO_2 phase. Apparatus and materials used in the phase study are described, the phase diagram is presented and discussed, and the activity of the Zr-ZrO_2 binary was measured. (M24c, P12a; Ti, Zr, O)

276-M. (English.) **On the Superstructure of the Ordered Alloy Cu_3Pd. Pt. 2. X-Ray Diffraction Study.** Makoto Hirabayashi and Shiro Ogawa. *Physical Society of Japan, Journal,* v. 12, Mar. 1957, p. 259-271.

According to X-ray diffraction study on the ordered Cu_3Pd crystals it was confirmed that the two-dimensional anti-phase superstructure characterized by two kinds of step shift exists in stable form in the compositions of 27.3 and 28.5% Pd after slow cooling from 450° C. to room temperature over a period of four months. The alloys containing 20.8 to 25.8% Pd, which were also annealed for four months, have the one-dimensional anti-phase superstructure. 12 ref.
(M26q; Cu, *Pd*)

277-M. (French.) **Contribution to the Study of Copper-Beryllium Alloys.** Arunachala Viswanathan. *Journal des Recherches du Centre National de la Recherche Scientifique.* no. 37, Dec. 1956, p. 303-318.

Structure of metallic films formed on these alloys depends greatly on their thickness. Electron diffraction photography was used to study structures. 14 ref.
(M27d, M22h; Cu, *Be.* 14-12)

278-M. (Japanese.) **Microstructure of Rolls for Cold Rolling. Pt. 2.** Takuo Ando, Keiya Gokan and Kenichi Arase. *Iron and Steel Institute of Japan, Journal,* v. 43, Apr. 1957, p. 451-456.

By water quenching after 3 hr. at 860° C., specimens which had been completely spheroidized showed properly distributed carbides in fine martensite matrix. Optimum conditions for the structure and hardness were found in the neighborhood of 860° C. 6 ref. (M27d, 2-14, W23k; ST)

279-M. (Japanese.) **Studies on Cr-Mo-Fe Super-Heat Resisting Alloys. Pt. I. The Equilibrium Diagram of Cr-Mo-Fe System.** S. Takeda and N. Yukawa. *Japan Institute of Metals, Journal,* v. 21, Apr. 1957, p. 275-279. (CMA)

Microscopy and thermal and X-ray analysis were used to study the Cr-Mo-Fe system. Six phases exist, including a hexagonal Fe_3Mo_2 phase, a tetragonal FeMo sigma phase, and a ternary compound phase ($Fe_{36}Mo_{10}Cr_{12}$). Three nonvariant reactions involving several phases and the melt are described.
(M24c; Cr, SGA-h)

280-M. (Russian.) **Fracture Method for Finding Steel Casting Defects.** K. I. Basov. *Liteinoe Proizvodstvo,* no. 1, Jan. 1957, p. 16-17.

Fracture method is supplementary to micrographic technique in determination of steel casting defects.
(M28h; ST, 5)

281-M. (Swedish.) **Crystallography and Metallography of Uranium.** Roland Kiessling. *Svensk Kemisk Tidskrift,* v. 68, no. 11, 1956, p. 581-587.

Historical survey of research; electron structure; spectrography of metals in the actinium group. Physical qualities of uranium (the coefficient of thermal expansion), and uranium alloys. 10 ref.
(M general, P11g; U)

282-M. (Book.) **Ore Microscopy. 2nd Ed.** Sigmund L. Smith. 278 p. 1957. Sturm & Smith, University Station, P.O. Box 4063, Tucson, Ariz. $10.

A text designed for the metallurgical, mining and geological engineer. Study of ores with various microscopes; methods for examination of fragments, polished specimens and thin section; correlation of minerals with geological deposits; sketches and charts. (M27; RM-n)

283-M. Crystal Structures of Transition Metal Silicides. Carol H. Dauben. *Electrochemical Society, Journal,* v. 104, Aug. 1957, p. 521-523.

Tables listing phases reported; ideal structure type; lattice constants; parameters of one type. 34 ref. (M26r; Si)

284-M. Structure Variation of Ingot Moulds in Use. *Foundry Trade Journal,* v. 103, July 4, 1957, p. 17-18.

Note on microstructure of ingot mold before and after use, describing ferrite and pearlite distributions. 5 ref. (M27d, W19c; ST)

285-M. Formation of Kink Bands During the Compression of Polycrystalline 70:30 Brass. M. Hatherly and L. E. Samuels. *Institute of Metals, Journal,* v. 85, June 1957, p. 437-440.

Investigates deformation band found in polycrystalline brass containing 30% zinc after small strains were introduced by rapid compression; considers nature and conditions associated with development of these kink bands and bands of secondary slip. 25 ref. (M26c, Q24a; Cu-n)

286-M. Bonding in Metals. Roland Kiessling. *Metallurgical Reviews,* v. 2, 1957, p. 77-107.

Discussion of physicist's and crystallographer's viewpoint of bonding. Several theories represent bonding in metals as similar to covalent bond. Need for further research on study of localized covalency of bonding. "Expanded" metallic structures may be means of studying metallic bonding. 64 ref. (M26)

287-M. Metallographic View. Pt. 36. High Speed Steels—Properties After Tempering. Howard E. Boyer. *Steel Processing and Conversion,* v. 43, July 1957, p. 380-381, 403.

Hardness and microstructure of M-2 type high speed steel specimens after being air cooled from temperatures in the range of 2200 to 2350° F. and double tempered at 1025° F. (To be continued.)
(M27, Q29a, J29; TS-m)

288-M. Classification of Stringers and Identification of Inclusions in Reactor-Grade Uranium. H. A. Saller. Battelle Memorial Institute, *U. S. Atomic Energy Commission,* BMI-965, Nov. 27, 1954, 21 p.

Characterization and identification of the inclusions comprising stringers in reactor-grade uranium.
(M28; U, 9-19)

289-M. Fundamental Considerations. Earl R. Parker. Lecture No. 2 of "Effect of Residual Elements on the Properties of Metals." American Society for Metals, p. 1-27.

Effects of lattice imperfections, solute atoms and presence of a second phase. 29 ref. (M26, 3-19)

290-M. Impurities in the Common Nonferrous Metals. F. N. Rhines. Lecture No. 2 of "Effect of Residual Elements on the Properties of Metals." American Society for Metals, p. 28-70.

Effects of impurities in solid solution and as second phases in aluminum, magnesium, copper and nickel. 14 ref.
(M27b, 3-19; Al, Mg, Cu, Ni, 9-1)

291-M. Phase Diagram of Titanium-Iron System. I. I. Kornilov and N. G. Boriskina. *Doklady Akademii Nauk SSSR,* v. 108, Nov. 6, 1956, p. 1083-1085. (*Henry Brutcher Translation* no. 3961.)

Based on thermal, dilatometric, micrographic and X-ray analyses, also on hardness and microhardness measurements. Experimental procedure and results; Ti-Fe phase diagram constructed on basis of results; solubility limit of titanium in alpha iron as function of temperature and in relation to susceptibility of alloys to aging. (M24b; Ti, Fe)

292-M. (German.) **Contribution to the Knowledge of the Partial Systems UC-TiC, -ZrC, -VC, -NbC, -TaC, -Cr_3C_2, -Mo_2C, and -WC.** H. Nowotny, R. Kieffer, F. Benesovsky and E. Laube. *Monatshefte für Chemie,* v. 88, June 15, 1957, p. 336-343. (CMA)

Study of the formation of solid solutions in systems composed of uranium monocarbide and carbides of metals of the fourth, fifth and sixth groups of the periodic table. The work was motivated by the recent proposals to use UC in the construction of nuclear reactors. It was expected that the introduction of a high-melting component would serve as a stabilizer. 6 ref.
(M24d; U)

293-M. (Russian.) **Effect of Structure of Hard Titanium Alloy Tool Tips on**

Their Work Life. P. K. Mikhailova. *Stanki i Instrument,* v. 28, June 1957, p. 26-27. (CMA)

The life of a titanium-tungsten hard tip depends on the structure of the grains of TiC, and on the relative sizes of the grains of TiC and WC. TiC grains may be made either of a single phase, or of two phases of which one is surrounded ringwise by the other. Such two-phase grains are considerably less resistant to wear than the single-phase ones. (M26r, T6n, 17-7; Ti, 6-19)

294-M. (Russian.) **Rate of Transformation of a Solid Solution Into Sigma Phase in the System Fe-Cr-V.** I. I. Kornilov and N. M. Matveeva. *Zhurnal Neorganicheskoi Khimii,* v. 2, June 1957, p. 1383-1391. (CMA)

The system Fe-Cr-V was used for testing the method of rates of transformations as a means for establishing phase diagrams of alloys. Complete agreement in the results obtained by this and by other methods was observed. Rates of formation of compounds FeCr and FeV at 700° C. are 350 and 11 hr., respectively. Rates of formation of sigma solid solutions depend on the composition of the alloys. The rate is higher in alloys whose composition approaches FeV than in alloys approaching FeCr. 11 ref.
(M24d, N6p, 3-17; Fe, Cr, V)

295-M Methods of Studying the Primary Structure of Welds. A. A. Rossoshinskii. *Avtomaticheskaya Svarka,* v. 8, no. 4, 1955, p. 90-94. (*Henry Brutcher Translation* no. 3992.)

A simple and reliable double-etch technique for revealing the primary structure of welds in low-carbon and low-alloy steels made by any welding process; examples of usefulness of method; upset welds in 0.06% C boiler plate steel; weld metal containing 2% Ni; primary structure of a 3% Ni steel weld compared with secondary structure.
(M27d, M20q; ST, AY, 7-1)

296-M. (English.) **New Tools Reveal Microscopic Secrets of Nature.** Vern W. Palen. *Engenharia, Mineracao e Metalurgia,* v. 25, Mar. 1957, p. 149-151.

Description of Philips electron microscope designed to permit quick change-over from electron microscopy to diffraction. Specimen preparation, operating procedures. Solves problems of particle identification, structure, surface and physical characteristics, dispersion and molecular weights. (M21e, 1-3)

297-M. (French.) **Identification and Study of the "Light Phenomenon" in Structural Hardening Ni-Cr and Ni-Cr-Co Alloys.** Charlotte Bückle and Jean-Pierre Poulignier. *Comptes Rendus,* v. 244, May 6, 1957, p. 2385-2388.

Speed of hardening is the factor determining appearance of "light phenomenon", which can also develop during a tempering operation. Crystal structure of "light zones" is shown by micrography.
(M27, J26, J29; Ni, Cr)

298-M. (German.) **Ternary System Titanium-Vanadium-Tin.** W. Koster and K. Haug. *Zeitschrift für Metallkunde,* v. 48, June 1957, p. 327-330. (CMA)

The phase diagram of the α system Ti-V-Sn was plotted for temperatures up to 1100° C. and tin contents up to 50%. The region along the Ti-V face of the prism, up to 10-20% Sn, is almost wholly occupied by the single phase of β solid solutions, while farther toward the Sn corner there are a two-phase region $\beta + Ti_3Sn$ and a three-phase region $\beta + Ti_3Sn + V_3Sn$. Near the titanium corner there occurs the transformation $\beta \rightarrow \alpha$. The solid solutions have a body-centered cubic structure. 8 ref. (M24c; Ti, V, Sn)

299-M. (German.) **The Ternary System Titanium-Silver-Aluminum.** W. Koster and A. Sampaio. *Zeitschrift für Metallkunde,* v. 48, June 1957, p. 331-334. (CMA)

A generalized phase diagram was constructed using metallographic and X-ray observations. As a general feature of the ternary diagram, the crystal phases belonging to the binary system Ti-Al are in equilibrium, first with the silver-rich melts, then, after solidification, with silver and silver-rich solid phases composing the binary system Ag-Al. 12 ref.
(M24c; Ti, Ag, Al)

300-M. (German.) **Recrystallization Texture of Hafnium.** D. E. Eppelsheimer and D. S. Gould. *Zeitschrift für Metallkunde,* v. 48, June 1957, p. 349-351. (CMA)

Samples of hafnium containing 3% Zr were cold rolled to 95% of the original thickness and annealed at 800° C., after which the recrystallization texture of the material was measured goniometrically. It is a

(0001) [1120] texture rotated 5-8° about an axis coinciding with the direction of rolling. This pattern is similiar to the recrystallization textures of zirconium and titanium. Hardness tests showed that hafnium is notably harder than zirconium and the hardening effect is more readily exhibited by hafnium than by zirconium. 10 ref. (M26c, N5; Hf)

301-M. (Italian.) **Origin of Characteristic Inclusions in Chromium Steel.** Raffaello Zoja. *Ricerca Scientifica,* v. 27, Jan. 1957, p. 119-122.

Complete picture of characteristic bi-phase inclusions and of the large number of inclusions derivable from same, for chromium steel with medium carbon and silicon content. Biphase inclusions originate from decomposition of a type of homogeneous inclusion. (M28; AY, *Cr,* 9-19)

302-M. (Japanese.) **Microscopic Examination of Steel-Sand Interface.** Tadao Sato and Tomoji Yoshikawa. *Casting Institute of Japan, Journal,* v. 29, June 1957, p. 439-446.

The observed structure of reaction products formed at high temperature at the interface of steel and sand molds; the relationship between steel structure and the adherence classified by three types: (1) slag infiltrating and adhering to the surface; (2) slag barrier surrounded by molten steel; and (3) penetration type. 5 ref. (M27; ST, NM-f45)

303-M. (Russian.) **Nonmetallic Inclusions in Nodular Cast Iron.** P. P. Arsentyev and Yu. Ya. Orlova. *Liteinoe Proizvodstvo,* v. 34, Apr. 1954, p. 23-24.

Cast iron samples were analyzed by electrolytic and petrographic means before and after addition of magnesium, and separately, ferrosilicate. Nonmetallic inclusions were found to be made up of SiO_2 in the form of yellowish grains, $3CaAl_2O_3$ in colorless clusters, $MgOAl_2O_3$ in form of colorless octohedral crystals and siliceous glass. Magnesium exceeded by several times the nonmetallic inclusions. (M27, M23; CI-r, 9-19)

304-M. The Binary System Sodium-Lithium. W. H. Howland and L. F. Epstein. Paper from "Symposium on Handling and Uses of the Alkali Metals." American Chemical Society, p. 34-41.

The sodium-lithium phase system has been studied by thermal analysis in the liquid and solid regions to temperatures in excess of 400° C. Correlation of the experimentally observed data with the Scatchard-Hildebrand regular solution model using the Flory-Huggins entropy correction is discussed. 10 ref. (M24b, P12; Na, Li, 14-10)

305-M. Electron Microstructure of Some Quenched and Tempered, Low-Alloy, Medium-Carbon Steels. R. P. Sernka and S. T. Ross. *American Society for Testing Materials, Proceedings,* v. 56, 1956, p. 398-408.

Electron micrographs show that percarbide films outline martensite needles tempered for 1 hr. or more in the 200 to 350° F. range; above 450° F., these films are supplanted by elongated and discontinuous cementite particles; no martensite subgrain network was found in electron micrographs of the samples; no microstructural differences were detected in electron micrographs of various steels tempered under the same conditions of time and temperature. 11 ref. (M21e, M27d; AY)

306-M. Method for Making Positive Replicas and the Preparation of Steel Specimen for Electron Microscopy. J. B. Le Poole and F. Van Wijk. *American Society for Testing Materials, Proceedings,* v. 56, 1956, p. 409-414.

Technique for preparing negative silver and positive carbon replicas. 3 ref. (M20r, M21e; ST)

307-M. Electropolishing of Ferrous Metal Specimens for Electron Metallography. F. W. Boswell. *American Society for Testing Materials, Proceedings,* v. 56, 1956, p. 426-435.

An investigation of the various electrolytes that have been recommended for ferrous specimens excepting those solutions involving perchloric acid which were considered somewhat hazardous for general laboratory use. (M20p, M21e; Fe, ST)

308-M. Comparison of Surface and Volume Transformations in Alloy Steel. L. S. Birks and R. T. Seal. *American Society for Testing Materials, Proceedings,* v. 56, 1956, p. 436-443.

In the bainite region, it appears that results from high-temperature X-ray diffraction and from thermal emission electron microscopy (both of which utilize the free surface of a specimen) can be interpreted without error. (M21e, M22g, N8m; AY)

309-M. Chemical Polishing of Steel for Electron Metallography. Ronald L. Scott. *American Society for Testing Materials, Proceedings,* v. 56, 1956, p. 444-457.

Interpretation of electron micrographs of steel polished by both mechanical and chemical methods is similar in most cases. 10 ref. (M20p, M21e; ST)

310-M. Electron Microscopic Identification of the Gamma' Phase of Nickel-Base Alloys. W. C. Bigelow, J. A. Amy and L. O. Brockway. *American Society for Testing Materials, Proceedings,* v. 56, 1956, p. 945-953.

Electrolytic etching for short periods in a reagent consisting of 5 ml. hydrofluoric acid (48%), 10 ml. glycerol, 10 to 50 ml. ethyl alcohol, and water to make 100 ml. total volume, produces a preferential attack on the particles of the intermetallic gamma' phase of nickel-base alloys containing titanium and aluminum. 9 ref. (M21e, M20q; Ni, *Ti, Al*)

311-M. Crystal Structures of Transition Metal Silicides. C. H. Dauben. *Electrochemical Society, Journal,* v. 104, Aug. 1957, p. 521-523. (CMA)

A table indicating structure types among transition metal silicides lists disilicides of titanium, zirconium, vanadium and molybdenum, Ti_5Si_3, Zr_5Si_3, TiSi, ZrSi, V_5Si_3, Mo_5Si_3, Ti_5Si_3, Zr_5Si_3, Zr_2Si, Zr_3Si_2, V_3Si and $MoSi_3$. V_2Si does not exist and Mo_3Si_2 does not exist in hexagonal form. Lattice constants and crystal forms are tabulated. 34 ref. (M26r; Ti, Zr, V, Mo, *Si*)

312-M. Domain Wall Orientations in Silicon-Iron Crystals. C. D. Graham, Jr., and P. W. Neurath. *Journal of Applied Physics,* v. 28, Aug. 1957, p. 888-891.

Experimental confirmation of calculations of energy of domain wall as a function of crystallographic orientation. In unstressed crystals with a (100) plane parallel to the surface, the 180° domain walls do not lie perpendicular to the surface but are inclined at a relatively large angle. An applied stress can greatly influence domain wall orientation. 8 ref. (M27g, M26; Fe, *Si*)

313-M. An Investigation of the Zirconium-Tantalum System. V. S. Emelyanov, Y. G. Godin and A. I. Evstyukhin. *Journal of Nuclear Energy,* v. 5, Pt. 2. *Soviet Journal of Atomic Energy,* v. 2, no. 1, 1957, p. 247-252. (CMA)

The Zr-Ta system was studied by X-ray diffraction, hardness measurements, thermal analysis, metallography and electrical resistance. The phase diagram is of the eutectic type. Alpha-Zr dissolves 0.22 at. % Ta and beta-Zr 16 at. % Ta at 1585° C. At 1585° C. tantalum dissolves 17 at. % Zr. The eutectic occurs at 1585° C. and 34 at. % Ta. The beta-Zr solid solution transforms eutectoidally at 790° C. and 7 at. % Ta. (M24b; Zr, Ta)

314-M. Sub-Microscopic Structure of "Ticonal" G Magnet Steel. H. B. Haanstra, J. J. de Jong and J. M. G. Smeets. *Philips Technical Review,* v. 19, no. 1, p. 11-14.

Structure of a single crystal of Alnico V. 4 ref. (M26; SGA-n, 14-11)

315-M. Metallographic Quality Studies of Thorium Metal. S. J. Broderick and A. J. Busch. New Brunswick Laboratory, *U. S. Atomic Energy Commission,* NBL-135, Apr. 1957, 39 p.

Thorium metal, as-cast, arc-melted ingots and rolled wrought metal has been examined microscopically for inclusion and stringer concentration. Tentative rating methods for metal quality have been proposed based on the number and diameter of the inclusion clusters in cast metal. 8 ref. (M27; Th, 9-19)

316-M. (English.) **Note on Preferred Orientations in Uranium as Determined by Dilatometric Studies.** Steinar Aas. *Tidsskrift for Kjemi, Bergvesen Og Metallurgi,* v. 17, no. 5, 1957, p. 77-80.

Uranium metal was reduced 80% by rolling. The thermal dilations of the finished plates were determined and correlated with theoretical dilations, calculated by assuming various types and degrees of preferred orientations. The results confirm that a (010)—(110) double texture develops at rolling temperatures just below the recrystallization point. 12 ref. (M26c; U)

317-M. (French.) **New Method of Preparation of Thin Metal Films for Electron Microscopy.** N. Takahashi, K. Kazato, K. Ashinuma and M. Watanabe. *Bulletin de Microscopie Appliquée,* v. 7, Apr. 1957 p. 29-33.

Diffraction diagram and microscopic image of selected region of object under study obtained simultaneously. Examples of use on Pb-

Sn, Al-Ag, Al-Zn, Cu-Al alloys and others. (M20, M21e)

318-M. (French.) **Study of the Elimination of Voids in High-Purity Aluminum.** Michel Wintenberger. *Comptes Rendus,* v. 244, June 3, 1957, p. 2800-2803.

Mechanism of elimination of excess voids; determination of density of dislocations induced in pure aluminum by plastic deformation. (M26s, M26b; Al)

319-M. (French.) **Resorption of Voids of Ferrous Oxide During Oxidation of Iron at High Temperature.** Michel Cagnet and Jean Moreau. *Comptes Rendus,* v. 244, June 12, 1957, p. 2925-2927.

Study of what happens to flux of voids entering Fe-FeO interface zone. 5 ref. (M26s, R1h; Fe)

320-M. (French.) **Theoretical Data on the Properties of Uranium.** A. Guinier. *Metaux-Corrosion-Industries,* v. 32, June 1957, p. 225-234.

Structure of uranium atom and crystal, thermal dilation, plastic deformation, effects of fission, action of uranium on other elements. 10 ref. (M25, M26, P11, Q general, 2-17; U)

321-M. (French.) **Film Mounts and Printing Techniques in Electron Microscopy. (Concluded.)** Roger Dargent. *Metaux-Corrosion-Industries,* v. 22, June 1957, p. 235-248.

Evaporation procedures, including preparation of films, shadow techniques, shadows on aluminum prints; cathodic atomizing as a metallographic etch method, including description of equipment used. 82 ref. (M21e, 1-3)

322-M. (French.) **Application of Electron Micrography to the Study of Crystal Surfaces and Intergranular Boundaries in Aluminum.** Pierre Bussy. *Ministere de l'Air, Publications Scientifiques et Techniques,* Paris, no. 325, 1957, 72 p.

Surfaces of electrolytically polished aluminum crystals presented varying appearances, depending on their orientation in relation to the lattice. Etching appeared to be produced by formation of submicroscopic faces parallel to planes (001). New experiments in intergranular corrosion of aluminum in hydrochloric acid indicated that homogenization of impurities and their diffusion to grain boundaries modifies kinetics of the etching process and appearance of specimens. Iron impurity presented different behavior, leading to a reverse type of etching called honeycomb. (M27f, M26, M21e, M20q; Al)

323-M. (French.) **Contribution to the Study of the Properties and Modes of Decomposition of the Protoxide Phase of Iron.** Robert Collongues. *Ministere de l'Air Publications Scientifiques et Techniques,* Paris, no. 324, 1957, 82 p.

Study by means of micrography and monochromatic X-ray diffraction. Ferrous oxide was formed by oxidizing iron in different mixtures of hydrogen and water vapor: influence of minimum traces of impurities on metal-oxide interface was studied, existence of substructure of protoxide of iron crystals discovered. Study of decomposition of ferrous oxide in iron and magnetite revealed existence of structures of products of decomposition quite similar to structures formed during austenitic decomposition. Structure of new phase formed by transformation of ferrous oxide phase at low temperature was determined. Study made it possible to consider ferrous oxide as a true solid solution with 570° C. eutectoid point. 70 ref. (M26r, M27a; Fe)

324-M. (German.) **Carbides in Ferrous Alloys With High Chromium and Carbon Content.** H. Tuma, K. Löbl and J. Jezek. *Neue Hütte,* v. 2, June 1957, p. 362-366.

Carbides in Fe-Cr-C alloys; changes in the composition and structure of carbides during holding at elevated temperatures. 8 ref. (M26r, 2-12; Fe, Cr, C)

325-M. (Italian.) **Structure and Plastic Deformation of Mild Steel Sheet.** Giuseppi Chiuppani. *Rivista di Meccanica,* no. 158, Mar. 1957, p. 41-49.

Grain size and its influence on deep drawing characteristics of mild steel; crystal network and changes brought about by plastic deformation. 8 ref. (M27c, Q24; CN, 4-3)

326-M. (Japanese.) **Microscopic Examination of Steel-Sand Interface.** Tadas Sato and Tomoji Yoshikawa. *Journal of Railway Engineering Research,* v. 14, June 15, 1957, p. 25-31.

Experimental methods; penetration mechanism of molten steel into sand. 5 ref. (M27, D9k; ST, 5-9)

327-M. (Book.) **Cobalt and Its Alloys. A Summary on Allotropy and Phase**

Diagrams. 107 p. 1957. Battelle Memorial Institute, 505 King Ave., Columbus 1, Ohio.

Collection of literature references and phase diagrams. Intermetallic compounds are indicated by their nearest chemical formula, and structure is shown. (M24, N6p; Co)

328-M. Crystal Structure of $PuAl_3$. Allen C. Larson, Don T. Cromer and C. K. Stambaugh. *Acta Crystallographica,* v. 10, July 1957, p. 443-446.

The crystal structure of $PuAl_3$ has been determined by single-crystal methods. The structure is hexagonal with $a = 6.10 \pm 0.02$, $c = 14.47 \pm 0.04$ A,Z = 6 units of $PuAl_3$ per unit cell, and most probable space group $P6_3/mmc$. 6 ref. (M26q; Pu, Al)

329-M. X-Ray Diffraction From Body-Centred Cubic Crystals Containing Stacking Faults. P. B. Hirsch and H. M. Otte. *Acta Crystallographica,* v. 10, July 1957, p. 447-453.

Calculations of the intensities diffracted from polycrystalline specimens of body-centered cubic crystals containing stacking faults on (211) planes. Possible applications of the theory to the anomalous line broadening from martensite and from cold-worked iron. 21 ref. (M22g, M26s; ST, Fe)

330-M. Some Data About the System Cerium-Thorium. J. H. N. van Nught. *Philips Research Reports,* v. 12, Aug. 1957, p. 351-354. (CMA)

Metallographic and X-ray diffraction studies of the system cerium-thorium show complete mutual solid solubility in the fcc phase; molybdenum intermetallic compounds are found. The deviation from Vegard's law as to lattice parameters is explained on the basis of strong binding forces compressing the radius of the cerium atoms. 5 ref. (M24b; Ce, Th)

331-M. Investigation of the System Zirconium-Tantalum. V. S. Emelyanov, Y. G. Godin and A. I. Evstyukhin. *Soviet Journal of Atomic Energy,* v. 2, no. 1, 1957, p. 43-49. (CMA) (Translated by Consultants Bureau, Inc.)

Metallographic, X-ray, thermal and electrical resistance methods were used in the study of the Zr-Ta system. The eutectic type phase diagram shows limited solubility: 0.22 at. % Ta in α-Zr at 790° C.; 16 at. % Ta in β-Zr at 1585° C.; and 17 at. % Zr in tantalum at 1585° C. A eutectic occurs at 1585° C. and 34 at. % Ta. A eutectoid alloy forms at 790° C. and 7 at. % Ta. The hardness of Zr-Ta alloys increases with the tantalum content. 9 ref. (M24b; Zr, Ta)

332-M. The Metallographic View. Pt. 37. High Speed Steels for Special Purposes. Howard E. Boyer. *Steel Processing and Conversion,* v. 43, Aug. 1957, p. 437, 463, 464.

Metallographs showing carbide distribution, following heating and tempering in AISI Type M-6 cobalt-bearing steel with high red hardness, and AISI Type T-3 steel containing 18% tungsten, 4% chromium and 3% vanadium with abrasion resistance properties. (M27d; TS-m)

333-M. (Czech.) **New Theories on the Structure of Carbo-Nitrided Layers.** Bohumil Prenosil. *Hutnicke Listy,* v. 12, no. 7, 1957, p. 597-604.

Study of carbo-nitrided layers containing more than 0.5% nitrogen indicated a current of micropore bands on certain austenitic grain boundaries; separation of molecular nitrogen from atomic nitrogen solid solution in austenite is thought to cause microscopic pore formation. (M27, J28m; ST)

334-M. (Czech.) **Quantitative Phase Analysis of Kovar Alloys by X-Ray Diffraction Methods.** Alexander Spirkov. *Hutnicke Listy,* v. 12, no. 7, 1957, p. 609-614.

Use of volumetric method elaborated by Fletcher and Cohen for steel alloys; when used for Kovar alloys, the values of G alpha and G gamma determined experimentally by dependence on temperature function. (M22g; Fe, Ni, Co)

335-M. (Czech.) **Direct Stabilization of X-Ray Radiation.** Frantisek Khol. *Hutnicke Listy,* v. 12, no. 7, 1957, p. 614-617.

Direct method for stabilization of characteristic X-ray radiation for structure examination; the fluctuation of characteristic radiation intensity was less than ½% during 8 hr. exposure time. Methods consist of mechanical control of heating circuit and electrical control by means of transducer. (M22g, 1-3)

336-M. (French.) **Images of Stressed Metal Samples Obtained by Photo-Emission Microscope.** R. Bernard, G. Guilland and R. Goutte. *Journal de Physique et le Radium,* v. 18, May 1957, p. 327-330.

Study of whether phenomenon of about 10% excitation of electronic emission provoked by electronic bombardment or ultra-violet light on metal samples subjected to tensile stress is localized at certain points of surface. Experimental apparatus, preliminary results with crude gold, recrystallized gold. Minute examination of photographs showed that certain increased brilliance observed on images cannot be easily explained by topography of specimen. It is more probable that increased brilliances correspond to increase in photoemissive power of zone of specimen where mechanical stress reaches maximum value. 4 ref. (M21e)

337-M. (French.) **Diffraction Chamber for X-Ray Analysis of Chromium.** F. Sebilleau. *Recherche Aeronautique,* no. 59, July-Aug. 1957, p. 33-37.

Reflection-type diffraction chamber intended particularly for study of steels and other materials containing chromium and cobalt. Optic principles and instrumental causes of spreading of diffraction rays; examples of application show, in particular case of the X-radiation used, value of methods based on reflection as compared to those based on transmission. (M22g; ST, *Cr, Co*)

338-M. (German.) **Behavior of High-Temperature Steels in Long-Time Creep Tests at Temperatures Between 500 and 700° C. Pt. 6. Austenitic and Ferritic Steels After Long Creep Tests.** Alfred Krisch. *Archiv für das Eisenhüttenwesen,* v. 28, May-June 1957, p. 305-310.

Microscopic and X-ray examination of specimens after electrolytic isolation of carbides. (M27d, M26r, Q3; SGA-h, AY)

339-M. (German.) **On the System Bismuth-Copper-Magnesium.** Raymund Dobbener. *Zeitschrift für Metallkunde,* v. 48, July 1957, p. 413-417.

The phase diagram of bismuth-copper-magnesium is developed from thermal and microscopic observations. The diagram is similar to that of the system antimony-copper-magnesium. Magnesium has a higher affinity to bismuth than to copper. 7 ref. (M24c; Bi, Cu, Mg)

340-M. (German.) **Equilibrium Conditions in the System Copper-Beryllium-Aluminum.** Otto Nickel. *Zeitschrift für Metallkunde,* v. 48, July 1957, p. 417-424.

The equilibrium conditions of ternary copper-beryllium-aluminum alloys are investigated up to 26% Be and 18% Al. In this part of the system solidification extends over two four-phase reactions. A critical point in the range of solidification is observed. 20 ref. (M24c; Cu, Be, Al)

341-M. (Portuguese.) **Note on Possible Modes of Twinning in Body-Centered Tetragonal Martensite Crystals.** Michiyasu Doi. *ABM, Associacao Brasileira de Metais, Boletim,* v. 13, Apr. 1957, p. 139-145.

Since recent studies do not confirm hypothesis that same type of twinning occurs in all martensite transformations of iron-base alloys, possibility is suggested, on basis of Mallard's law of a {101}, <101> type of twinning. 8 ref. (M27e, N8p; Fe)

342-M. (Portuguese.) **Study of the Microstructure of Cast Aluminum-Copper Alloys.** Isaac Berezin. *ABM, Associacao Brasileira de Metais, Boletim,* v. 13, Apr. 1957, p. 147-163.

Types of Al-Cu alloys for industrial use; equilibrium diagram of Al-Cu system; structure of six specimens containing from 4.5% to 45% copper. 11 ref. (M27d, M24b; Al, Cu)

343-M. A Method for the Etching of Metals by Gas Ion Bombardment. J. B. Newkirk and W. G. Martin. *American Society for Metals, Transactions,* v. 50, Preprint No. 8, 1957, 13 p.

An improved method for the etching of metal surfaces by bombardment with gas ions. Novel features, including the use of krypton as the etching agent and the application of a magnetic field in the ionization chamber, have made it possible to etch metallographic specimens more rapidly and with less heating of the specimen than has been reported heretofore. 3 ref. (M20r)

344-M. Occurrence of Laves-Type Phase Among Transition Elements. R. P. Elliott and W. Rostoker. *American Society for Metals, Transactions,* v. 50, Preprint No. 22, 1957, 28 p.

The periodic variation of the crystal structure type of the laves phases of titanium, zirconium, hafnium, columbium and tantalum may be correlated with electronic variations. Allotropy is the exception rather than the rule and occurs only for those binary phases that have electron:atom ratios near a critical

value. Consideration of ternary laves-type phases indicates that there are two Brillouin zone overlaps governing the structure type. 27 ref. (M26; Ti, Zr, Hf, Cb, Ta)

345-M. Thorium-Zirconium and Thorium-Hafnium Alloy Systems. E. D. Gibson, B. A. Loomis and O. N. Carlson. *American Society for Metals, Transactions,* v. 50, Preprint No. 24, 1957, 34 p.

The thorium-zirconium and thorium-hafnium systems have been studied by electrical resistance; thermal, microscopic and X-ray methods and phase diagrams have been proposed for each. The thorium-zirconium system was investigated extensively by high-temperature X-ray methods. 13 ref. (M24b; Th, Zr, Hf)

346-M. Hydrogen-Uranium Relationships. M. W. Mallett and M. J. Trzeciak. *American Society for Metals, Transactions,* v. 50, Preprint No. 36, 1957, 18 p.

The relationships in the uranium-uranium hydride-hydrogen system were studied. These included the solubility of hydrogen in massive uranium, the sorption of hydrogen by powdered uranium and equilibrium pressures for the plateaus of the pressure-composition isotherms. Phase diagrams were constructed from these data. Also, the rates of diffusion of hydrogen in alpha and beta uranium were determined. 8 ref. (M24b, N15d; U, H)

347-M. Grain Boundary Movement in Bicrystalline Aluminum. R. B. Pond and Eleanor Harrison. *American Society for Metals, Transactions,* v. 50, Preprint No. 43, 1957, 11 p.

An investigation of the plastic deformation of aluminum bicrystals having grain boundaries normal to the specimen axis is reported. Data indicate that these "free" boundaries behave quite differently than boundaries which contain the specimen axis and are therefore influenced by a grip effect. A technique for producing transverse boundaries is described. Stress-strain diagrams for such specimens are given which show that the index of strain hardening for bicrystals whose boundaries are free to translate is lower in the plastic region than the index for single crystals of the parent orientation. 14 ref. (M27f, Q24; Al)

348-M. Relation Between Constitution and Ultimate Grain Size in Aluminum-1.25% Manganese Alloy 3003. Philip R. Sperry. *American Society for Metals, Transactions,* v. 50, Preprint No. 49, 1957, 33 p.

The major microstructural difference between wrought products from 3003 aluminum alloy ingot which has or has not been given a high-temperature homogenization heat treatment lies in the greater quantity of fine precipitate particles in the latter. This high concentration of constituent particles leads to a modification of the normal recrystallization process in a manner which favors the formation of coarse recrystallized grains. The grain size in either case is a function of the recrystallization process only, subsequent grain growth being negligible. 16 ref. (M27c, N5; Al, 4-3)

349-M. The Tantalum-Columbium Alloy System. D. E. Williams and W. H. Pechin. *American Society for Metals, Transactions,* v. 50, Preprint No. 54, 1957, 15 p.

The constitutional diagram is an unbroken series of solid solutions. No evidence of a solid transformation was found in any of the alloys. The solidus line rises smoothly from the melting point of columbium, 2420° C., to the melting point obtained for tantalum, 2940° C. and the liquidus was found to follow quite closely the path taken by the solidus. 4 ref. (M24b, Ta, Cb)

350-M. Partial Phase Diagrams of the Systems Mg-Th and Mg-Th-Zr. A. S. Yamamoto and W. Rostoker. *American Society for Metals, Transactions,* v. 50, Preprint No. 55, 1957, 24 p.

A phase diagram for the Mg-Th system up to 70% has been constructed showing an intermediate phase Mg, Th forming by a peritectic reaction and a eutectic reaction forming (Mg + Mg, Th) from the melt at 42% Th and 582° C. The maximum solid solubility of Th in Mg has been set at 4.5%. A tentative vertical section for Mg-Th-1% Zr has been outlined. A ternary peritectic reaction has been postulated to account for unusual cast microstructures. The limit of the Mg terminal solid solution does not appear to be appreciably altered by additions of Zr. 9 ref. (M24b, M24c; Mg, Th, Zr)

351-M. Etchant for Stainless Type 403 Forgings. Richard D. Buchheit. *Metal Progress,* v. 72, Sept. 1957, p. 95-96.

Electrolytic method for etching nickel-base, chromium-base and high-alloy steels. (M20q; SS, 4-1)

352-M. Contributions to the Nowotny Phases. Edwin Parthé. *Powder Metallurgy Bulletin,* v. 8, June 1957, p. 23-34.

Investigation by X-ray diffraction of Nowotny phases in metal silicide systems with carbon, nitrogen or oxygen additions; discusses lattice constants, compositions of hexagonal structures for Nowotny phase and two tetragonal structures with titanium, zirconium, hafnium, vanadium, columbium, tantalum, chromium, molybdenum or tungsten as metal components. 26 ref. (M26r; 6-20, Si)

353-M. X-Ray Study of Carbide Phase of Patented Steel Wire. V. M. Golubkov and V. K. Kritskava. Problems of Metallography and Metal Physics, 4th Collection of Papers, 1955, Moscow, p. 461-464. (*Henry Brutcher Translation* no. 3950.)

X-ray determination of the dimensions of blocks in carbide particles of patented 0.80% carbon steel wire after various cold reductions and after tempering at different temperatures; interpretation of X-ray diagrams obtained by ionization method; size of blocks; distribution of carbide particles in ferrite. (M26r, M22g, ST, 4-11)

354-M. Use of Electron Diffraction for the Study of Oxide Films on the Surface of Cemented Carbides. K. P. Imshennik and V. A. Landa. *Zavodskaya Laboratoriya,* v. 23, no. 6, 1957, p. 699-702. (*Henry Brutcher Translation,* no. 4041.)

Merits of electron diffraction for revealing the presence of titanium dioxide on as-delivered and on oxidized surfaces of tool tips high in titanium carbide, and of tungsten oxide on surface of oxidized specimens low in, or containing no titanium carbide. Method recommended for removing titanium dioxide from tips before brazing them onto tool shanks. (M22h; SGA-j, 6-20, 14-12)

355-M. (Czech.) Quantitative Metallographic Lattice Analysis. Stanislav Drapal, Vratislav Horalek and Zdenek Rezny. *Hutnicke Listy,* v. 12, no. 6, 1957, p. 485-491.

Study of relations between range of measurement, degree of accuracy and probability of obtaining this accuracy in quantitative metallographic lattice analysis. A comparison of results of extensive measurement obtained in using the lattice method and random point method showed accuracy of both methods to be the same and conclusions derived by means of mathematical statistics for random points method can be applied to lattice method. 8 ref. (M26)

356-M. (French.) **A Very Senstive Micrographic Method for Detecting Hydrogen in Alpha Uranium.** Andre Robillard and Daniel Calais. *Comptes Rendus,* v. 245, July, 1957, p. 59-62.

Halated phase of uranium; heat treatments which provide best conditions for detection of last traces of hydrogen in alpha uranium in hydride form. 6 ref. (M23; U, *H*)

357-M. (French.) **Persistence of Networks of Impurities and Imperfections in a Pure Iron After Various Heat Treatments.** Pierre Coulomb. *Comptes Rendus,* v. 245, Aug. 12, 1957, p. 799-802.

Micrographic etching reveals pattern of previous boundaries and subboundaries in a 99.96% pure iron, thereby demonstrating stability of reticular structures of impurities and imperfections. 6 ref. (M26s, M27f; Fe-a)

358-M. Surface Distributions of Dislocations in Metals. Pt. 2. C. J. Ball. *Philosophical Magazine,* v. 2, 8th Series, Aug. 1957, p. 977-984.

It is shown that rotation axis of a boundary containing dislocations of three systems can lie anywhere on surface of a cone; to each direction of the rotation axis there corresponds a single boundary plane. The theory cannot explain experimental evidence on misorientations in zinc unless slip occurs in non-basal directions, or on planes not hitherto reported, at high temperatures. Experimental evidence for face-centered cubic metals is insufficiently precise to form a test of the theory. 5 ref. (M26b)

359-M. Impurity-Vacancy Interaction in a Metal. L. C. R. Alfred and N. H. March. *Philosophical Magazine,* v. 2, 8th Series, Aug. 1957, p. 985-997.

Using a generalization of model first introduced by Mott for dealing with impurities in monovalent metals, interaction between an impurity and a vacancy was studied. Detailed computations were carried out for

case of copper, with a divalent impurity and a vacancy at a separation of 5 atomic units. Interaction is attractive, associated energy being calculated as 0.08(4) ev. when exchange and correlation energies are neglected. Inclusion of these effects reduces interaction energy to 0.03(3) ev. 21 ref. (M26s; Cu)

360-M. Alloys of Platinum Metals With Boron, Phosphorus and Silicon. *Platinum Metals Review,* v. 1, Oct. 1957, p. 136-137.

Eutectic temperature measurements with the hot-stage microscope. (From *Revue de Metallurgie,* v. 54, no. 5, 1957, p. 321-336.) (M24, M21; Pt, *B, P, Si*)

361-M. Composition Variation in the α-Phase Compound of the Vanadium-Aluminum System. A. E. Ray and J. F. Smith. *Acta Crystallographica,* v. 10, Sept. 10, 1957, p. 604-605. (CMA)

Previous work on the structure of the alpha-phase compound in the V-Al system is corroborated. However, while earlier samples had 10% or less of the 8(b) sites occupied by aluminum atoms, crystals investigated in the present study were found to have about 50% of the 8(b) sites so occupied. This indicates that the alpha-phase can exist over a range of composition, this composition variation arising from the varying degree of occupancy of the 8(b) sites. Composition limits of VAl_{10} and V_2Al_{21} are inferred. (M26q; V, Al)

362-M. Electron Micrographs From Thick Oxide Layers on Aluminum. C. J. L. Booker, J. L. Wood and A. Walsh. *British Journal of Applied Physics,* v. 8, Sept. 1957, p. 347-352.

Electron micrographs were obtained of pore structure in thick oxide layer formed by anodizing aluminum in sulphuric acid. Pores were shown to be minute tubes of approx. 200 A. diameter running perpendicularly through oxide and ending almost in contact with underlying metal. Pore base thickness was estimated and effect of a change in anodizing conditions on pore base is shown. 20 ref. (M27, M21e; Al, 9-18, 8-23)

363-M. Study of the Deformed Layer Produced on Metal Surfaces by Mechanical Machining, Abrasion and Polishing Operations. (Concluded.) L. E. Samuels. *Electroplating and Metal Finishing,* v. 10, Oct. 1957, p. 315-318, 343.

Polishing rates of representative methods and polishing times required for the removal of abrasion deformation in 70:30 brass specimens; maximum depth of deformed layers; variations in abrasion rates. 38 ref. (M20p, M27; Cu-n)

364-M. Nature of Mechanically Polished Metal Surfaces: Surface Deformation Produced During the Abrasion and Polishing of Zinc. L. E. Samuels and G. R. Wallwork. *Institute of Metals, Journal,* v. 86, Sept. 1957, p. 43-48.

The deformed layer produced on surfaces of polycrystalline zinc by metallographic abrasion and polishing treatments has been investigated by a taper-sectioning technique. The depth of the deformed layer resulting from various machining, abrasion and polishing treatments has been studied. 20 ref. (M20p, M27; Zn)

365-M. Effect of Edge Dislocations on Alloying of Indium to Germanium. Jacques L. Pankove. *Journal of Applied Physics,* v. 28, Sept. 1957, p. 1054-1057.

Edge dislocations and other crystal disturbances enhance dissolution of germanium in indium. Hence, under equilibrium conditions, deep alloying results, with smaller spread of indium than in case where crystal is free from these defects. Recrystallized structure over an edge dislocation differs considerably from structure at undisturbed sites. Shape of alloy front is determined by surface tension forces and tendency to terminate in (111) planes. (M26b; In, Ge)

366-M. Phase Diagram Studies of Zirconium With Silver, Indium, and Antimony. J. O. Betterton, Jr., J. H. Frye, Jr., and D. S. Easton. Oak Ridge National Laboratory. *U. S. Atomic Energy Commisssion,* ORNL-2344, Aug. 28, 1957, 52 p. (CMA)

Variation of phase boundaries arising from $\alpha \rightleftarrows \beta$ transition can be reduced to a behavior common to other systems if a metallic valency of two is assumed for zirconium, and allowance is made for size differences in atoms. Titanium systems are compared. 24 ref. (M24b; Zr, Ag, In, Sb)

367-M. (French.) **Autoradiographic Detection of a Segregation of Traces of Sulphur in the Boundaries of Iron Annealed in the Alpha Phase.** Claude Leymonie, Pierre Coulomb and Paul

Lacombe. *Comptes Rendus,* v. 245, Sept. 2, 1957, p. 931-934.

Study of specimen containing 0.003% sulphur revealed marked segregation along intergranular boundaries. This phenomenon, it is claimed, supports hypothesis of abnormal segregation of atoms of impurities in boundaries at temperatures higher than limit solubility temperature. 7 ref.
(M13q, 9-19; Fe)

368-M. (German.) **Exposure Diagrams for X-Ray Film Work on Titanium and Zirconium.** K. Sagel. *Metall,* v. 11, Sept. 1957, p. 769. (CMA)

Exposure diagrams for various voltages using a distance of 60 cm. between X-ray source and film. Transformation factors for other distances, using either metal or salt intensifying foils, are also given. (M22g; Ti, Zr)

369-M. (German.) **Thermodynamic Data and Equilibrium Diagrams of Metallurgical Systems. Pt. 1.** W. Hirschwald, O. Knacke and P. Reinitzer. *Zeitschrift für Erzbergbau und Metallhüttenwesen,* v. 10, Mar. 1957, p. 123-127.

Calculation and tabulation of beta functions of a large number of chemical compounds which incorporate the integrals of specific heats. Equilibrium constants of a chemical reaction are calculated by simple addition of the beta functions of the participants of the reaction.
(M24, P12)

370-M. (Russian.) **Electronic Structure of Nickel and Nickel Alloys.** G. S. Krinchik. *Fizika Metallov i Metallovedenie,* v. 4, no. 1, 1957, p. 36-40.

Definition of ferromagnetic model of nickel s-electrons explains experimental data obtained for magnetic saturation, paramagnetic susceptibility and spectrographic diffraction coefficient of several nickel alloys. Experimental corroboration of the validity of the theoretical assumptions is demonstrated by measurement of spectrographic diffraction coefficient of Ni_3Mn alloy. 11 ref.
(M25, P16; Ni)

371-M. (Russian.) **Texture of Iron Mill Scale. Pt. 9. Electrographic Investigation of Textures in Hematite Layer at Different Stages of Iron Oxidation in Air.** V. I. Arkharov and B. S. Borisov. *Fizika Metallov i Metallovedenie,* v. 4, no. 1, 1957, p. 76-83.

Systematic electrographic investigation of the oxidation layers on iron, formed between 300 and 900° C. in time intervals from 5 min. to 48 hr. Hypothesis of the texture change on basis of oxygen and iron atoms diffusion and recrystallization of the scale. 15 ref.
(M26c, R1h; Fe, 9-2)

372-M. (Russian.) **Classification of Peculiarities of Polyhedric Structure of Metals and Alloys as Observed Under the Microscope.** V. G. Vorobev. *Zavodskaia Laboratoria,* v. 23, July 1957, p. 808-811.

General classification of metal microstructure is proposed according to size, shape and anisotropy of the grain; relief, thickness, roundness and phase dispersion of the border layer; relief, legibility, continuity, thickness and character of the grain boundary and finally according to the type of contact of more than two grains. (M27c)

373-M. (Russian.) **Metallographic Investigation of Carbide Phases of High Speed Cutting Steel.** M. S. Chaadaeva. *Zavodskaia Laboratoria,* v. 23, July 1957, p. 811-813.

A 4% solution of sodium hydroxide, saturated with potassium permanganate, is used to detect Me_6C carbides, and MeC carbides are detected by electrolysis in 1% solution of chromic acid. (M26r; TS-m)

374-M. (Russian.) **Detection of Microstructure of Metals Using Ultraviolet Microscope.** T. G. Porokhova. *Zavodskaia Laboratoria,* v. 23, July 1957, p. 813-817.

The method can be applied to specimens without etching if the phases differ in color at a given wave length. Photographs of AgSi, Cu-Cu_3P and FeNiCrNb alloys. (M21d)

375-M. (Russian.) **Investigation of Composition, Structure and Limits of Homogeneity of Phases in the System Vanadium-Carbon-Oxygen. Pt. 1. System Vanadium-Carbon.** M. A. Gurevich and B. F. Ormont. *Zhurnal Neorganicheskoi Khimii,* v. 2, July 1957, p. 1566-1580. (CMA)

Using chemical and X-ray methods, the region of the V-C system in the composition range between pure vanadium and VC was investigated in the temperature range 980-2300° C. The conditions of formation of gamma, delta and epsilon phases, their crystal structure and physical properties were examined in detail. Like many other carbides of transition metals, vanadium carbides show

varying crystal structure. They are among the hardest known. 78 ref. (M26r; V)

376-M. (German.) **Investigations of the Partial Systems Aluminum-$TiSi_2$, -$ZrSi_2$, -$MoSi_2$ and -WSi_2.** H. Nowotny and H. Huschka. *Monatshefte für Chemie*, v. 88, Sept. 27, 1957, p. 491-501. (CMA)

A series of investigations on the basic structure of quenched alloys of the type Al-Si-$MeSi_2$ (Me = Ti, Zr, Mo, W) showed the existence of isomorphic ternary phases Mi(Si, $Al)_2$ with a C-40 structure in the case of molybdenum and tungsten. Lattice parameters for the molybdenum and tungsten systems. The ternary phases with zirconium and titanium show a similarity to ZrSi. 12 ref. (M24c; Al)

377-M. (German.) **Investigations on the Surfaces of Solid Materials by Electron Emission Microscopy.** E. B. Bas. *Planseeberichte für Pulvermetallurgie*, v. 5, Aug. 1957, p. 42-52. (CMA)

Principles of electron emission microscopy, particularly for the study of surface reactions on metals. Surface reactions occurring in the carburization of molybdenum are explained on the basis of ten micros. 2 ref. (M21e; Mo)

378-M. (German.) **High-Temperature Microscopy.** Premysl Rys. *Neue Hütte*, v. 2, Aug. 1957, p. 489-497.

Theory of high-temperature structural investigation; grain-boundary furrow formation; austenite grain growth; determination of austenite grain size; graphite layers; deformation of the polished surfaces. 7 ref. (M21, 2-12, M27; ST)

379-M. (German.) **Palladium-Iridium Alloys.** Ernst Raub and Werner Plate. *Zeitschrift für Metallkunde*, v. 48, Aug. 1957, p. 444-447.

Results of X-ray and microscopic examination of platinum-iridium alloys, crystallinic behavior, hardness and high quench hardening. 2 ref. (M27, M26, Q29n; Pd, Ir)

380-M. (German.) **Deformation and Recrystallization Textures of Tin-Rich Aluminum Alloys.** Konrad Sagel. *Zeitschrift für Metallkunde*, v. 48, Aug. 1957, p. 463-465.

Pressing, drawing and rolling textures of aluminum with 57 to 70% zinc; interpretation of the relation between the preferential orientations of the high-temperature alpha solid solution and of the two phases precipitating from it. 5 ref. (M26c; Al, *Sn*)

381-M. (Italian.) **Electronic Pattern of Metals.** Aldo Mayer. *Chimica e l'Industria*, v. 39, Sept. 1957, p. 751-754.

Brief exposition of electronic structure of metals and of Pauling's theory of the metallic bond of resonant valency; comparison of resonance in graphites and in metals. 10 ref. (M25, P18m)

382-M. (Book.) **Phase Diagrams in Metallurgy.** Frederick N. Rhines. 340 p. 1957. McGraw-Hill Book Co., Inc., 330 W. 42nd St., New York 36, N. Y. $12.

Text for the undergraduate student presenting material on the binary, ternary, and quaternary levels. (M24)

383-M. (Book.) **Grain Boundaries in Metals.** Donald McLean, 370 p. Sept. 1957. Oxford University Press, 16-00 Pollitt Dr., Fair Lawn, N. J. $8.

Historical introduction; theories of the structure of grain boundaries; energies of interfaces; energies of grain boundaries and microstructure; equilibrium segregation at grain boundaries; sliding at and the migration of grain boundaries, special features of low-angle problems. Basic problems and numerical data. (M27f)

SECTION N

TRANSFORMATIONS and RESULTING STRUCTURES

1-N. **Observations on Grain-Boundary Migration in Aluminium Bicrystals.** K. T. Aust, E. H. Harrison and R. Maddin. *Institute of Metals, Journal,* v. 85, Sept. 1956, p. 15-16.

Rates of migration were measured at temperatures of 560, 600 and 640° C. for strain-free bicrystals having orientation differences of 55° and 85° about $\langle 110 \rangle$. (N3; Al)

2-N. **Phase Changes in Pile-Irradiated Uranium-Base Alloys.** M. L. Bleiberg, L. J. Jones and B. Lustman. *Journal of Applied Physics,* v. 27, Nov. 1956, p. 1270-1283.

Electrical resistivity, temperature coefficient of electrical resistivity, hardness and density measurements as well as X-ray diffraction patterns indicated that the stable phases at room temperature reverted to the metastable gamma phase during irradiation.
(N6, P15, P10, Q29, 2-15; U)

3-N. **Effects of Growth Rate on Crystal Perfection and Lifetime in Germanium.** A. D. Kurtz, S. A. Kulin and B. L. Averbach. *Journal of Applied Physics,* v. 27, Nov. 1956, p. 1287-1290.

Effects of crystal growth rate and growth direction on the density of random dislocations and on the minority carrier lifetime. (N3; Ge)

4-N. **Growth of Gray Cast Iron.** F. N. Tavadze and I. A. Bairamashvili. *Henry Brutcher Translation No.* 3815, 13 p. (From *Liteinoe Proizvodstvo,* 1956, no. 5, May 1956, p. 15-18.) Henry Brutcher, Altadena, Calif.

Previously abstracted from original. See item 331-N, 1956. (N3; CI)

5-N. (English.) **On the Characteristics of Bainite Transformation.** Kazuo Tsuya. *Journal of Mechanical Laboratory (Japan),* v. 2, no. 1, 1956, p. 20-27.

Details of the characteristics observed under a hot stage microscope, qualitative interpretations of the results. (N8; AY)

6-N. (English.) **Transformations in Various Metals and Alloys Observed by Thermionic Emission Microscope. I. Titanium.** Kenji Ikeda and Shiro Ogawa. *Science Reorts of the Research Institutes, Tohoku University,* ser. A, v. 8, no. 5, Oct. 1956, p. 391-398.

Specimens in the form of a strip were directly heated by electric current and activated by (Ba, Sr)O. Several orientations of striations were observed in an original β grain in the course of cooling.
(N6, X3; Ti)

7-N. (Czech.) **Structural Stability of Alloys With High Amounts of Chromium and Carbon.** Karel Löbl, Hanus Tuma and Jaroslav Jezek. *Hutnické Listy,* v. 11, no. 10, Oct. 1956, p. 592-599.

Influence of temperature and annealing time in an alloy with 30% chromium and 3% carbon. Structure, chemical composition and morphology of carbides.
(N8, 2-11, 3-17; Cr)

8-N. (French.) **Thermo-Elastic Analysis of the Transformations of Titanium.** Albert Portevin and Robert Cabarat. *Comptes Rendus,* v. 243, no. 16, Oct. 15, 1956, p. 1085-1086.

Transformations in the solid state of 99.9% titanium of density 4.49 at 20° C. (N6, Q21; Ti)

9-N. (French.) **Determination of a Kirkendall Effect in γ Phase Uranium-Zirconium Diffusion.** Yves Adda, Jean Philibert and Claude Mairy. *Comptes Rendus,* v. 243, no. 16, Oct. 15, 1956, p. 1115-1118.

Displacement of reference marks on initial interface as function of temperature and duration of diffusion. Coefficients of intrinsic diffusion determined by the Darken relationship. (N1; U, Zr)

10-N. (French.) **Abnormal Scattering of X-Rays During the Precipitation in a Nickel Alloy With 7% of Silicon.** Jack Manenc. *Comptes Rendus,* v. 243, no. 16, Oct. 15, 1956, p. 1119-1121.

Abnormal scattering appears in the first stage of precipitation as happens with other nickel alloys, especially 80-20 nickel-chromium hardened with aluminum and titanium. (N7, M22; Ni, Si)

11-N. (French.) **Effect of the Surface State and Structure on Stainless Steel Activity.** Henri Hatwell. *Revue de Métallurgie,* v. 53, no. 10, Oct. 1956, p. 729-749.

Studies the stability of the passive state of iron-chromium alloys exposed to high vacuum. "Honeycomb corrosion" described. (N15, R1; SS)

12-N. (French.) **Sensitivity to Aging of Various Steels Brought to Evidence by Simple Brinell Tests.** E. Houdremont, W. Wepner and H.-J. Wiester. *Revue de Métallurgie,* v. 53, no. 10, Oct. 1956, p. 750-756.

A simple Brinell test at a moderately elevated temperature (less than 300° C.) identifies the steels according to their sensitivity to aging. (N7, Q29, ST)

13-N. (German.) **Contemporary State of Knowledge of Austenite Transformation in Steels.** A. Rose. *Schweizer Archiv für angewandte Wissenschaft und Technik,* v. 22, no. 10, Oct. 1956, p. 305-318.

TTT-diagrams for isothermal transformation and for continuous cooling for technical alloy steels. (N8; AY, CN, TS)

14-N. (Russian.) **Low-Temperature Recrystallization in Metals.** R. I. Garber, I. A. Gindin, V. S. Kogan and B. G. Lazarev. *Doklady Akademii Nauk SSSR,* v. 110, no. 1, Sept.-Oct. 1956, p. 64-66 + 1 plate.

Study of changes occurring in the microstructure of commercial iron (0.03% carbon) and nickel deformed at the temperature of liquid nitrogen. (N5, M27; Fe, Ni)

15-N. (Russian.) **Study of the Recrystallization of Titanium and Its Alloys. II. Recrystallization Diagrams of Titanium Alloys.** Iu. A. Zot'ev, E. M. Savitskii, M. Ia. Tylkina and A. N. Turanskaia. *Izvestiia Akademii Nauk SSSR, Otdelenie Tekhnicheskikh Nauk,* no. 8, Aug. 1956, p. 135-138 + 1 plate.

Recrystallization diagram of an alloy based on hydride-calcic titanium with an addition of chromium. Microstructural peculiarities of this alloy deformed at various temperatures of forging and annealed after hot working. (N5; Ti)

16-N. (Russian.) **Methods of Studying the Isothermal Decomposition of Structurally Free Carbides in Cast Iron.** M. V. Voloschenko. *Zavodskaia Laboratoriia,* v. 22, no. 10, Oct. 1956, p. 1194-1197.

Kinetics of carbide decomposition when cast iron specimen is protected by chromium plating and when unprotected. Microstructural changes in specimens before and after heat treatment. (N8; Cr, CI)

17-N. (Russian.) **Some Methods for Determining Recrystallization Temperatures.** G. K. L'vov. *Zavodskaia Laboratoriia,* v. 22, no. 10, Oct. 1956, p. 1198-1200.

Change in coercive force and in hardness during recrystallization. Measurement by the "double-hardness" method, and the microstructural method with local deformation. Effect of heating and of silicon content. (N5, M21, M23; Fe)

18-N. **Solid Solubilities and Electrical Properties of Tin in Germanium Single Crystals.** F. A. Trumbore. *Electrochemical Society, Journal,* v. 103, Nov. 1956, p. 597-600.

Solubility determined from 400° C. to the melting point of germanium using conventional crystal pulling techniques and crystal growth from melts in a thermal gradient. Results confirm the electrical neutrality of tin in germanium. (N12p, P15, Sn, Ge, 14-11)

19-N. **Alloy Carbides Precipitated During the Fourth Stage of Tempering. An Electron Microscopic Examination.** Kehsin Kuo. *Iron and Steel Institute, Journal,* v. 184, Nov. 1956, p. 258-268.

The precipitation of minute Mo_2C, VC, and TiC 'threads' at 500-600° C. causes an increase in hardness, and their growth into needles, disks, and spheroids above 600° C. causes a decrease. (N7d, Q23a; Mo, V, Ti, NOa-35)

20-N. **The Occurrence of Sigma-Phase in a High-Chromium-Nickel Steel With Particular Reference to the Influence of Silicon.** L. Pryce, H. Hughes and K. W. Andrews. *Iron and Steel Institute, Journal,* v. 184, Nov. 1956, p. 289-301.

New work establishes the pronounced effect of silicon on the formation of σ by increasing both the amount of the phase and its speed of formation. (N6p; AY)

21-N. **Mass Spectrometric Study of Phase Changes in Aluminum, Praseo-**

dymium, and Neodymium. Robert G. Johnson, Donald E. Hudson, Wallace C. Caldwell, Frank H. Spedding and William R. Savage. *Journal of Chemical Physics,* v. 25, Nov. 1956, p. 917-925.

A sensitive method for measuring rapidly the latent heat of vaporization or sublimation of metals of low volatility. Latent heat, melting point and phase transition temperature measurements.
(N6p, P12n, P12q; Al, Pr, Nd)

22-N. **The Evaporation of Impurities From Silicon.** S. E. Bradshaw and A. I. Mlavsky. *Journal of Electronics,* v. 2, ser. 1, Sept. 1956, p. 134-144 + 1 plate.

Equations describing the combined effects of evaporation and segregation are derived, and the rates of evaporation of certain impurities calculated. (N16n, C general; Si)

23-N. **Beta-Omega Age Hardening Means Stronger Zirconium Alloys.** S. A. Robinson, J. R. Doig, M. W. Mote, C. M. Schwartz and P. D. Frost. *Journal of Metals,* v. 8, Nov. 1956, p. 1544-1545.

The β-ω phase transformation, important in many titanium alloys, was revealed in zirconium alloys. Hitherto unattainable tensile strength with adequate ductility is now feasible for certain zirconium alloys.
(N7a, Q23n, Q23p; Zr)

24-N. **Self-Diffusion of Iron in Molten Fe-C Alloys.** Ling Yang, M. T. Simnad and G. Derge. *Journal of Metals,* v. 8; *American Institute of Mining and Metallurgical Engineers, Transactions,* v. 206, Nov. 1956, p. 1577-1580.

Diffusion coefficients measured by using the capillary method. Samples were autoradiographed and sectioned to insure that no significant convection occurred during the diffusion. (N1c; Fe)

25-N. **Isothermal and Continuous Cooling Transformation Diagrams.** G. Mayer. *Metal Treatment and Drop Forging.* v. 23, Nov. 1956, p. 451-456.

General features of isothermal transformation diagrams and their application to continuous-cooling conditions. (To be continued.)
(N8g; ST)

26-N. **Mechanism of Diffusion of Copper in Germanium.** F. C. Frank and D. Turnbull. *Physical Review,* v. 104, ser. 2, Nov. 1, 1956, p. 617-618.

In the interstitial state solubility of copper is about 10^{-2} times less and diffusivity many orders of magnitude greater than in the substitutional state. Conversion from interstitial to substitutional is effected by lattice vacancies which are generated at free surfaces and dislocations. (N1c, M26b, M26s; Cu, Ge)

27-N. (French.) **Electron Display Study of a Cellular Structure During the Cold Working Stage and Restoration of Commercial Titanium.** M. Adrien Saulnier. *Comptes Rendus,* v. 243, no. 18, Oct. 29, 1956, p. 1319-1322.

Sheets of commercially pure titanium were obtained after annealing at 650° C. and cold working. The state between cold working and recrystallization was analyzed after further annealing. (N5, J23; Ti)

28-N. (French.) **The Autoradiagraphy by α Trajectories, Applied to the Analysis of Uranium-Zirconium Alloys and to the Study of Uranium-Zirconium Diffusion.** Henriette Faraggi, Arlette Garin-Bonnet, Yves Adda and Jean-Marie Henry. *Comptes Rendus,* v. 243, no. 18, Oct. 29, 1956, p. 1316-1319.

A study of thick layers of uranium-zirconium alloys showed a practical relationship between alpha emission and uranium content, which was applied to the study of diffusion.
(N1, M23q; Zr, U)

29-N. (German.) **Hardening and Separation of Platinum-Iridium Alloys.** Ernst Raub and Werner Plate. *Zeitschrift für Metallkunde,* v. 47, no. 10, Oct. 1956, p. 688-693.

Alloys show a broad miscibility gap at lower temperatures with its highest point at approximately 975° C. and 50% iridium. At 700° C. the gap extends from 7 to 99% iridium. (N12; Pt, Ir)

30-N. (Russian.) **On the Intermediate Transformation of Austenite.** L. M. Pevzner, T. D. Kubyshkina, G. M. Rovenskii and A. I. Samoilov. *Metallovedenie i Obrabotka Metallov,* no. 10, Oct. 1956, p. 2-20.

A study of the redistribution of carbon in the process of the intermediate transformation of austenite, and of the kinetics of the ultimate stages of decomposition. The transformation was observable in all alloy steels in special diffusion conditions. (N8, N1; AY)

31-N. (Russian.) **On the Pearlite Transformation in Alloy Steel.** R. I. Entin. *Metallovedenie i Obrabotka Metallov,* no. 10, Oct. 1956, p. 20-28.

Criticism of a study of the influence of the alloying elements on the kinetics of pearlite transformation and of the structural and chemical cohesion of the phases of aus-

tenite decomposition.
(N8h, 2-10; AY)

32-N. (Russian.) **On Grain Growth in Commercial Titanium During Heating.** L. N. Sokolov. *Metallovednie i Obrabotka Metallov,* no. 10, Oct. 1956, p. 34-36.

The effect of the heating temperature and soaking time on previously deformed commercial titanium.
(N3, F21, 2-11; Ti)

33-N. **The Behaviour of Interfaces in Lightly Worked Uranium During Recrystallization.** P. E. Madsen. *Institute of Metals, Journal,* v. 85, Oct. 1956, p. 71-75 + 3 plates.

The boundaries of twins and kinks in uranium appear to possess an appreciable surface energy, and on annealing they undergo alterations which would be expected from a tendency to reduce the surface area.
(N5f; U)

34-N. **Analysis of Ferromagnetic and Antiferromagnetic Second-Order Transitions.** J. A. Hofmann, A. Paskin, K. J. Tauer, and R. J. Weiss. *Physics and Chemistry of Solids,* v. 1, Sept.-Oct. 1956, p. 45-60.

Magnetic specific-heat curves were deduced for a number of ferromagnetic and antiferromagnetic materials from their total specific-heat curves. (N11, P12r; SG-n)

35-N. (English.) **The Diffusion of Electro-Deposited Chromium Into Pure Iron.** Shigetomo Ueda. *Castings Research Laboratory, Report, Waseda University,* 1956, no. 7, p. 83-86.

Chromium-plated iron was heated in a vacuum, and the diffusion coefficient and activation energy calculated. (N1b; Cr, Fe, 8-12)

36-N. (German.) **Coarse Grain Formation in Copper With Trace Element Inclusions.** F. Erdmann-Jesnitzer and E. Vogler. *Metall,* v. 10, no. 21-22, Nov. 1956, p. 1008-1020.

Effect of iron, tin, nickel, zinc, manganese, magnesium, phosphorus and sulphur on the crystallization of pure copper at various temperatures. (N3m, 2-10; Cu)

37-N. (German.) **Hardening and Recrystallization of Copper-Cobalt and Copper-Manganese-Cobalt Alloys With High Copper Content.** K. L. Dreyer and J. Geissler. *Metall,* v. 10, no. 21-22, Nov. 1956, p. 1028-1033.

Investigation of above by measuring Vickers hardness and electric resistance at low temperature and at temperatures of 500 to 600° C.
(N5, Q23a, P15g; Cu)

38-N. (German.) **On the Significance of the Dislocation Layer for the Coercive Force Theory of Recrystallized Materials.** Martin Kersten. *Zeitschrift für Angewandte Physik,* v. 8, no. 10, Oct. 1956, p. 496-502.

An attempt to derive a quantitative theory of ferromagnetic hysteresis and of coercive force of technically pure recrystallized materials from the hypothesis that the curvature of the Block wall under the pressure of the field energy is the important elementary feature.
(N5f, P16)

39-N. (German.) **The Orientation of Metal Layers Deposited by Vaporization on Copper Single Crystal Surfaces —Electron Interference Examination.** Oswald Haase. *Zeitschrift für Naturforschung,* v. 11a, no. 10, Oct. 1956, p. 862-864 + 2 plates.

Surfaces of copper single crystals were electrolytically polished and then cleaned by a special process. Copper, silver, gold, palladium and zinc were vapor deposited. Resulting layer orientation observed and explained. (N15g; Cu, 14-11)

40-N. (Russian.) **The Energy of Hole Formation in Metals and Alloys.** S. D. Gertsriken. *Fizika Metallov i Metallovedenie,* v. 3, no. 2, 1956, p. 238-241.

Claims a superior method of calculating the energy of hole formation in diffusion processes using the entire heat curve. (N1c)

41-N. (Russian.) **Diffusion of Cobalt in Cobalt-Aluminum Alloys.** S. D. Gertsriken and I. Ia. Dekhtiar. *Fizika Metallov i Metallovedenie,* v. 3, no. 2, 1956, p. 242-246.

Determining the parameters of diffusion of cobalt in cobalt-aluminum alloys. (N1b; Al, Co)

42-N. (Russian.) **Diffusion Studies on the Elimination, by Heating at Elevated Temperatures, of the Traces of Martensitic Transformations.** *Fizika Metallov i Metallovedenie,* v. 3, no. 2, 1956, p. 278-281.

The variation in self-diffusion as a function of the temperature and time of prediffusion heat treatment.
(N1d, N6q; ST)

43-N. (Russian.) **Peculiarities in the Structure of Structural Steel in the Reversible Temper Brittleness State. I. Microstructure Studies. II. Fractographic Studies.** S. F. Iur'ev and Z. I. Kusnitsina. *Fizika Metallov i Metallovedenie,* v. 3, no. 2, 1956, p. 280-298 + 2 plates.

A study to determine the structural elements along which the fracture develops in steels due to temper brittleness. (M27, Q26s; ST)

44-N. (Russian.) **Nonhomogeneity of Carbon in Martensite After High-Frequency Tempering of Steel Specimens.**

I. N. Kidin. *Fizika Metallov i Metallovdenie,* v. 3, no. 2, 1956, p. 299-305.

X-rays make possible a more accurate analysis of the carbon nonhomogeneity which is useful in explaining structural changes and properties of steel after high-frequency tempering. (N8a, J29; ST)

45-N. (Russian.) **Relationship Between the Carbon Content in Martensite and the Heating Parameters of High-Frequency Tempered Steel Specimens.** I. N. Kidin. *Fizika Metallov i Metallovedenie,* v. 3, no. 2, 1956, p. 306-308.

Concludes that the high degree of hardness after high-frequency tempering is determined by both the total amount of carbon in the steel and its distribution in the martensite crystals. (N8a, J29, Q23a; ST)

46-N. (Russian.) **Recrystallization Texture of Cold Drawn Steel.** Ts. N. Rafalovich. *Fizika Metallov i Metallovedenie,* v. 3, no. 2, 1956, p. 326-331.

Tests on two types of steel indicated that the orientation of the crystallites of the texture of recrystallization was completely identical with the orientation of the texture of the deformed matrix. (N5g; ST)

47-N. (Russian.) **The Effects of Deformation Conditions on the Tendency of Steel to Mechanical Aging.** M. I. Kurmanov. *Fizika Metallov i Metallovedenie,* v. 3, no. 2, 1956, p. 332-340.

The effects of aging can be reduced by reducing the nitrogen and oxygen content or by combining them into stable solution by admixtures of boron, vanadium or aluminum. (N7, 2-10; ST)

48-N. (Russian.) **The Effects of the Rate of Growth of Aluminum Single Crystals on Their Mosaic Structure.** D. E. Ovsienko and E. I. Sosina. *Fiziki Metallov i Metallovedenie,* v. 3, no. 2, 1956, p. 374-382.

Recrystallization conditions and the fine structure of aluminum single crystals. Increasing the rate of growth increases the disorientation of the mosaic blocks. (N3r, 3-17; Al)

49-N. (Russian.) **The Diffusion of Lead in Lead Telluride.** B. I. Boltaks and Iu. N. Mokhov. *Zhurnal Tekhnicheskoi Fiziki,* v. 26, no. 11, Nov. 1956, p. 2448-2450.

Adding lead changes conduction from hole to electron conduction. The coefficient of diffusion varies from 35 at 773° K. to 0.7 to 532° K. Diffusion process is similar to that of copper in germanium.
(N1c, P15; Pb, Te)

50-N. **The Calculation of Transformation Temperatures and Austenite-Ferrite Equilibria in Steel.** K. W. Andrews. *Iron and Steel Institute, Journal,* v. 184, Dec. 1956, p. 414-427.

The theoretical basis from the standpoint of equilibrium diagrams; some qualitative and semi-quantitative relationships, equations for transformation temperatures. Specific applications, practical cases. 16 ref. (N8; ST)

51-N. **Isothermal and Continuous-Cooling Transformation Diagrams of Steels. Part 2.** G. Mayer. *Metal Treatment and Drop Forging,* v. 23, Dec. 1956, p. 495-498.

Determination of continuous-cooling diagrams; comparison of the usefulness of isothermal and continuous-cooling transformation data. 8 ref. (N8g; ST)

52-N. **Zirconium Alloys.** E. E. Hayes. Paper from "Zirconium—Technology and Economics". Atomic Industrial Forum, p. 51-54. (CMA)

Zirconium alloys are discussed generally; they are classed into three systems: α solid solution, β solid solution, and totally soluable. The two outstanding α additions, tin and aluminum, raise hot hardness and decrease workability. Large amounts of β additions are soluble, but cannot be retained at lower temperatures. The completely soluble additions, titanium and hafnium, have little value. The best zirconium alloys are the α-β alloys. Yield strengths, creep and elongation are considered. (N6p, Q23, 2-10; Zr)

53-N. (French.) **Various Forms of Graphite Found in Gray Cast Iron.** Michel Ferry. *Fonderie,* No. 126, Oct. 1956, p. 395-429.

The chraacteristics of graphite in gray cast iron as identified in the ASTM classification illustrated and tabulated. (N8s; CI)

54-N. (Japanese.) **Aging of Permanent Magnets.** Nabou Makino. *Metals,* v. 26, Dec. 1956, p. 918-922.

The reason for aging of permaent magnets; reduction ratio of retentivity for materials; effect of external conditions; effect of change in crystal lattice and by heat on retentivity. Methods of reducing aging. 8 ref. (N7, P16; SGA-n)

55-N. (Japanese.) **Kirkendall Effect.** Koda. *Metals,* v. 26, Dec. 1956, p. 950-952.

Kirkendall's experiments on diffusion of metals; nature of lattice

vacancies; producing and diminishing vacancies. (N1c, M26s)

56-N. Determination of 1600 and 1700° C. Liquidus Lines in $CaO.2Al_2O_3$ and Al_2O_3 Stability Fields of the System $CaO-Al_2O_3.SiO_2$. Frederick C. Langenberg and John Chipman. *American Ceramic Society, Journal,* v. 39, Dec. 1, 1956, p. 432-433.

Liquidus lines determined from the chemical analyses of saturated slags at these temperatures. (N12; RM-g)

57-N. Carbides in Low-Alloy Steels. Experiments on Their Compositions. J. E. Bowers. *Iron and Steel,* v. 29, Dec. 8, 1956, p. 628-630.

Determination of isothermal transformation curves; transformation diagnosis for several alloy steels. (N8g, N8r; AY)

58-N. Bainitic Retained Austenite . . "Conditioning" In En 40C and Occurrence in Other En Steels. J. A. Cameron. *Iron and Steel,* v. 29, Dec. 8, 1956, p. 631-633.

Graphs and tables showing dilatometer deflections with temperature. (N8n; AY)

59-N. Martensite and Bainite. W. Steven and A. G. Haynes. *Iron and Steel,* v. 29, Dec. 8, 1956, p. 634-638.

Errors inherent in assessing the proportions of untempered martensite in a structure; standard procedure for determining martensite formation ranges; influence of chemical composition on bainite reaction. (N8p, N8m; ST)

60-N. Diffusion of Aluminum in Single Crystal Silicon. R. C. Miller and A. Savage. *Journal of Applied Physics,* v. 27, Dec. 1956, p. 1430-1432.

Aluminum solid solubilities in the neighborhood of 10^{19} atoms per cc. found over the 1200 to 1400° C. temperature range. (N1e; Si, 14-11, *Al*)

61-N. Growth Bends in Iron Whiskers. George S. Baker. *Journal of Applied Physics,* v. 27, Dec. 1956, p. 1561-1562.

Bend caused by the whisker axis shifting from one crystal direction to another. (N3r; Fe)

62-N. Growth of Large Diameter Silicon and Germanium Single Crystals. W. R. Runyan. *Journal of Applied Physics,* v. 27, Dec. 1956, p. 1652.

Six-inch germanium and 4-in. silicon crystals were grown. (N3r; Si, Ge)

63-N. (Japanese.) **On the Recrystallization of Aluminum Alloys Containing Titanium.** I. Obinata and S. Kugasa. *Japan Institute of Metals, Journal,* v. 20, Oct. 1956, p. 533-536. (CMA)

The effect of titanium on the recrystallization behavior of Al-Mg alloys and cold-rolled aluminum was studied by X-ray and microscopy. Adding titanium raises the recrystallization temperatures by 50° C. up to 0.1-0.2% Ti; grain size after annealing is also refined. Recrystallization diagram. (N5f, 2-10; Al, *Ti*)

64-N. (Japanese.) **Study on the Grain Refinement of Cast Al and Its Alloys. III. The Influence of Hot Working on the Refined Cast Structure of Al and Al Alloys.** S. Terai, *Japan Institute of Metals, Journal,* v. 20, Oct. 1956, p. 536-540. (CMA)

The influence of hot working on the cast structure of aluminum alloys refined by titanium with or without boron additions was studied. Preheating of ingots caused the cast grain size to grow but larger refining additions reduced grain growth. This was true also in the rolled condition. 5 ref. (N3m, 3-18; Al)

65-N. (Book.) **Order-Disorder Phenomena.** E. W. Elcock. 166 p. 1956, John Wiley & Sons, Inc., 440 Fourth Ave., New York 16, N. Y. $2.50.

Order-disorder of binary alloys and the relation of binary alloy ordering to other topics in solid-state physics. (N10b)

66-N. Solution-Rate Studies With Liquid Metals: Solution of Copper in Liquid Lead and Bismuth. A. G. Ward and J. W. Taylor. *Institute of Metals, Journal,* v. 85, Dec. 1956, p. 145-152.

Kinetics of dissolution, experimental method and its results. 16 ref. (N12; Cu, Pb, Bi)

67-N. Creep-Resisting Steels. M. G. Gemmill, H. Hughes, J. D. Murray, F. B. Pickering and K. W. Andrews. *Iron and Steel,* v. 29, Dec. 8, 1956, p. 614-623.

High-temperature steels; structural and theoretical aspects of TiC, TiN, gamma phase, laves phase, kappa carbide; and for effect of rates of cooling and isothermal heating on precipitation behavior; effects of prior structure, mechanical and high-temperature properties. (N7b, N8, 2-10; SGA-h)

68-N. Magnetic Method for the Measurement of Precipitate Particle Sizes in a Cu-Co Alloy. J. J. Becker. *Journal of Metals,* v. 9, Jan. 1957, p. 59-63.

By means of magnetization curves the precipitation of cobalt in a 2% Co copper alloy was followed, the effective particle radii growing from 12 to 70 Angstroms with increasing aging time. 14 ref. (N7b; Cu, *Co*)

69-N. Control of Strain Aging in Alpha-Iron. Eric R. Morgan and J. C. Shyne. *Journal of Metals,* v. 9, Jan. 1957 p. 65-69.

Strain aging is described in terms of the Cottrell theory. Deduced that practical control of strain aging must come through control of effective amounts of carbon and nitrogen in solution. Existing control methods are reviewed and their deficiencies described. Use of titanium, aluminum, vanadium, and boron for control of nitrogen strain aging is examined. 14 ref.
(N7e; Fe, *Ti, Al, V, B, N*)

70-N. Simple Orientation Relationships for Secondary Recrystallization in Si-Fe. C. G. Dunn and P. K. Koh. *Journal of Metals,* v. 9, Jan. 1957, p. 81-86.

Information on textures after primary recrystallization and after secondary recrystallization from the view point of oriented nucleation growth selective theory. Explanation for large primaries (nuclei) occurring in specific orientations. 12 ref. (N5h; Si, Fe)

71-N. Nucleation of Voids in Metals During Diffusion and Creep. R. Resnick and L. Seigle. *Journal of Metals,* v. 9, Jan. 1957, p. 87-94.

Experimental evidence is presented which proves that voids formed during diffusion in brass are heterogeneously nucleated. When the nuclei, probably ZnO, are removed by remelting, practically no voids form upon subsequent dezincification. Brass, freed of void nucleation catalysts, exhibited reduced tendency for grain boundary cracking during creep, and increased stress-rupture life. 18 ref.
(N1, Q3m; Cu-n)

72-N. Studies on Diffusion in Molten Metals. Kichizo Niwa, Mitsuo Shimoji, Satoshi Kado, Yoshihiko Watanabe and Toshio Yokokawa. *Journal of Metals,* v. 9, Jan. 1957, p. 96-101.

Diffusion coefficients in molten metals were measured for Sn-Pb, Bi-Pb, Sb-Pb, Cd-Pb, Sn-Bi, and Sb-Sn from 450° to 600° C. Results show that the relations between diffusion coefficients and atomic fractions obey the thermodynamic formulas of irreversible processes. 19 ref.
(N1e; 14-10)

73-N. Effect of Rolling Procedure on the Kinetics of Recrystallization of Cold-Rolled Copper. J. T. Michalak and W. R. Hibbard, Jr. *Journal of Metals,* v. 9, Jan. 1957, p. 101-106.

OFHC copper was rolled 96.4% by straight-pass, cross-pass, and compression-pass techniques. Materials developed different deformation and recrystallization textures, different 1-hr. recrystallization temperatures, and different recrystallization kinetics, although they had the same temperature dependence of the rate of recrystallization, QR. 11 ref.
(N5f, F23, 1-17; Cu)

74-N. On the Kinetics of the Pearlite Reaction. John W. Cahn. *Journal of Metals,* v. 9, Jan. 1957, p. 140-144.

Re-evaluation of existing kinetic data in terms of recently derived rate laws. Nucleation rate varies more rapidly with temperature than previously supposed. Time dependence of the nucleation rate obtained from kinetic date is consistent with that observed by metallographic methods. Analysis of pearlite reaction in presence of carbide particles. 13 ref. (N8h)

75-N. The Repeated Strain Aging of Mild Steel. B. B. Hundy and T. D. Boxall. *Metallurgia,* v. 55, Jan. 1957, p. 27-30.

Results of experiments show that the effects of all aging and cold working of mild steel on the mechanical properties are additive. Explanation is given based on the dislocation theory of strain aging. 6 ref. (N7e; CN)

76-N. The Effect of Titanium Content on the Age Hardening and Nitriding of Type 322 Stainless Steel. M. R. Achter. *U. S. Atomic Energy Commission. WAPD-RM*-91, Sept. 26, 1951, 10 p. (CMA)

Titanium is the chief hardener in Type 322 stainless but concentration control is difficult. Concentration affects the nature of the nitrided case. A hardness curve was constructed from data on specimens with different titanium contents. The steel high in titanium tended to show pitted and spalled cases; 0.70% Ti seems to be the critical content. Other factors were implicated. (N7a, 2-10; SS, *Ti*)

77-N. Graphitization of Steel in Petroleum Refining Equipment. Joseph G. Wilson. *Welding Research Council Bulletin Series,* no. 32, Jan. 1957, p. 1-35.

Graphitization under service conditions; effect of steel specifications; effect of certain elements. 11 ref. (N8s, 1-10; ST)

78-N. The Effect of Graphitization of Steel on Stress-Rupture Properties. Joseph G. Wilson. *Welding Research Council Bulletin Series,* no. 32, Jan. 1957, p. 36-44.

Concentrated forms of graphite at weld heat-affected zones may adversely affect the rupture strength of steel. Random forms of graphite up to "moderate" degrees in the unaffected parent metal do not appear to be detrimental. (N8s, Q3m; ST)

79-N. (German.) **Recrystallization Experiments With Nickel-Chromium and Iron-Nickel-Chromium Alloys.** Hannelore Kofler-Valencak and Helmut Krainer. *Archiv für das Eisenhüttenwesen,* v. 27, Nov. 1956, p. 725-730.

The cold working and recrystallization behavior of the 80-20 and 30-20 Ni-Cr and Fe-Ni-Cr alloys with regard to mechanical properties, grain growth and X-ray data corresponds to the usual behavior of cold worked and heat treated alloys. The decrease or invariability of the electrical resistance during cold working and the deviations of the relaxation curves of the electrical resistance are irregular. 6 ref. (N5, P15g; Ni, *Cr,* SS)

80-N. (German.) **Calorimetric Investigations of the Kinetics of the Tempering of Martensite.** Otto Krisement. *Archiv für das Eisenhüttenwesen,* v. 27, Nov. 1956, p. 731-742.

Four unalloyed steels with 0.21, 0.41, 0.58 and 0.79% C were investigated with regard to the martensite tempering between room temperature and 300° C. The microcalorimetric procedure according to Borelius was applied. Correlations between phase transformations and heat generation are described. 17 ref. (N8p, 1-4; CN)

81-N. Phase Transformations in Iron-Platinum Alloys Near the Composition Fe_3Pt. A. E. Berkowitz, F. J. Donahoe, A. D. Franklin and R. P. Steijn. *Acta Metallurgia,* v. 5, Jan. 1957, p. 1-12.

Resistance measurements on polycrystalline wires were used to study the ordering process. Resistivity, Curie temperature, metallographic and magnetic examination and the results. 6 ref. (N10a, 1-4; Fe, *Pt*)

82-N. Surface Migration on Tantalum Crystals Under Influence of Electric and Thermal Gradients. David B. Langmuir. *Acta Metallurgia,* v. 5, Jan. 1957, p. 13-23.

Stereographic projection and diffusion studies. 15 ref. (N1a; Ta)

83-N. Self-Diffusion and Interdiffusion in Gold-Nickel Alloys. J. E. Reynolds, B. L. Averbach and Morris Cohen. *Acta Metallurgia,* v. 5, Jan. 1957, p. 29-40.

The data are combined with the thermodynamic properties to test the validity of the Darken equation. Equations for the relationship between the activation energies for self and interdiffusion. (N1b, P13a; Au, Ni)

84-N. Atomic Radiation Used to Study Growth of "Whiskers" on Metals. *Bell Laboratories Record,* v. 35, Jan. 1957, p. 29.

X-ray studies of the crystal structures of metal. (N3r, M23q)

85-N. The Structure of Titanium Deposits Formed in Electrolytic Cells Using Fused Alkali Chloride Bath. R. S. Dean, W. W. Gullett and F. X. McCawley. *Chicago Development Association, Contributions to Titanium Metallurgy. Paper no. 2,* 1957, 6 p. (CMA)

Electrolytically formed titanium deposits of practical value are of three coexisting types: a titanium plate on the cathode, a dispersion of fine titanium crystals in the salt bath, and coarse titanium crystals from a supersaturated solution of alkali metal. The dispersion is depleted of titanium because of the formation of the cathode plate. (N12d; Ti)

86-N. Grain Growth in Steels: Role of Aluminium Nitride—Part I. A. B. Chatterjea and B. R. Nijhawan. *Metal Treatment and Drop Forging,* v. 24, Jan. 1957, p. 3-6.

Results of brief survey of information on grain growth in steels and alloys; different views on grain-growth inhibition in steels. 53 ref. (N3m; ST)

87-N. Chemical Diffusion Rates in Alpha and Beta Zirconium-Tin Solutions. R. Resnick and R. Balluffi. *U.S. Atomic Energy Commission, SEP-118,* Aug. 11, 1953, 12 p. (CMA)

The chemical diffusivity of tin-stabilized α-phase in zirconium-rich alloys was studied using sandwich couples and argon atmosphere. Empirical relations were derived which cover β diffusivity in the range 800-

850° C. and α diffusivity in the range 1100-1300° C. 5 ref.
(N1e; Zr, *Sn)*

88-N. Metallographic Examination of Zircaloy-2 Subjected to Various Annealing Treatments. E. L. Richards. *U.S. Atomic Energy Commission, WAPD-RM-156,* Nov. 26, 1952, 21 p. (CMA)

Zircaloy-2 in the as-forged and rolled condition was heat treated. A suitable heat treatment consists of holding at 850° C. for 15 min. and air cooling; complete recrystallization resulted. The hardness is Rockwell B-85 to 89. The α-β transformation begins in the 900-925° C. range. (N6p, J23c; Zr)

89-N. (French.) **Cinematographic Study of the Growth of Titanium β Crystals by Means of the Emission Electron Microscope.** Mecheline Sorel-Sternberg and Robert Arnal. *Academie des Sciences. Comptes Rendus des Seances,* v. 244, no. 1, Jan. 2, 1957, p. 92-95. (CMA)

Crystal growth in titanium has been studied by means of an emission electron microscope provided with a recording device. The temperature of the sample was raised to 1100° C. for 15 min., cooled below the $\beta \rightarrow \alpha$ transformation point (880° C.), and finally reheated to 1100° C. The observations indicate that the thermal treatment introduces a stress in the β crystals which permits one to obtain these β crystals at a high temperature in a simple manner. (N16p, M21e; Ti)

90-N. (Italian.) **Study of Crystal Orientation in Cold Rolled and Recrystallized Carbon Steel.** H. Weik. *Metallurgia Italiana,* v. 48, Nov. 1956, p. 494-502.

Pretreatment of samples and research procedures; influence of degree and method of rolling, of temperature of recrystallization; method of eliminating crystal orientation resulting from rolling. Geiger counter method of evaluation used. 28 ref. (N5g; CN)

91-N. (Report.) **A Critical Review of the Mechanism of Aging in Alloys Based on the Aluminum-Zinc-Magnesium System.** I. J. Polmear. ACA-59. 22 p. Aug. 1955. Australian Aeronautical Research Committee, Aeronautical Research Laboratories, Box 4331, P.O., Melbourne, Australia.

Effect of age hardening on the changes in structure and properties in alloys of the 75S type. The most significant factor in the development of high strength properties lies in the pronounced effect of small additions of magnesium on the aging characteristics of the binary aluminum-zinc alloys. Qualitative treatments are suggested to account for this effect, one based on lattice strain energy and the other on thermodynamic relationships.
(N7a; Al, *Zn, Mg*)

92-N. (Book—French.) **Curves of Transformation of Steels of French Manufacture. Volume II.** G. Gelbart and A. Constant. Institut de Recherches de la Siderurgie, St. Germain-en-Laye, France.

Fifty time-temperature-transformation curves (isothermal transformation diagrams) of various types of steel—tool, chromium, manganese, etc. Contains also Jominy curves, tables of chemical composition, photomicrographs. (N8g; ST)

93-N. Modern Heat Treatment. Adrian A. Hofman. *Australasian Engineer,* No. 43, Dec. 7, 1956, p. 47-55.

Discussion of time-temperature transformation curves and modern heat treatment methods. Reference to the relationships between transformations conducted isothermally and on continuous cooling, and examples of practical procedure and results obtained. (N8g, J general)

94-N. Diffusion in Ordered and Disordered Copper-Zinc. A. B. Kuper, D. Lazarus, J. R. Manning and C. T. Tomizuka. *Physical Review,* v. 104, Dec. 15, 1956, p. 1536-1541.

The measurement of diffusivities of copper, zinc and antimony in single crystals of 47-48 at. % Zn, copper-zinc (beta brass) over the temperature range 265-817° C., by using section techniques.
(N1a; Cu-n, 14-11)

95-N. Evidence for Vacancy Mechanism in Intermetallic Diffusion. L. Slifkin and C. T. Tomizuka. *Physical Review,* v. 104, Dec. 15, 1956, p. 1803-1804.

Vacancy mechanism in intermetallic diffusion of binary ordered alloy of the type AB. (N1c)

96-N. A Resistometric Study of the Kinetics of Precipitation in Lead-Tin Alloys. G. Borelius and L. E. Larsson. Paper from "Mechanism of Phase Transformations in Metals". Institute of Metals, 1956, p. 67-75.

The study of the precipitation process in two lead-tin alloys containing 19.2 and 23.5 at. % tin by measuring the resistivity as a function of time at a number of constant temperatures. 6 ref.
(N7b, 1-4; Pb, *Sn*)

97-N. Precipitation of the Theta Phase in 1632 Aluminium-4% Copper Alloys. G. Thomas and J. Nutting. Paper from "Mechanism of Phase Transformations in Metals". Institute of Metals, 1956, p. 57-66.

Effects of plastic deformation before and during the precipitation of the theta phase. Microstructures obtained have been interpreted by assuming the theta phase may nucleate and grow preferentially from immobile dislocations.
(N7, N2; Al, *Cu*)

98-N. Structure of the Omega Precipitate in Titanium-16% Vanadium Alloy. J. M. Silcock, M. H. Davies and H. K. Hardy. Paper from "Mechanism of Phase Transformations in Metals". Institute of Metals, 1956, p. 93-104.

Martensitic transformation in titanium alloys is suppressed by the presence of more than a critical concentration of a beta-stabilizing element. Decomposition of the quenched beta phase occurs by nucleation-and-growth processes and involves the formation of an intermediate precipitate, termed omega, the structure of which has been determined for the first time. 30 ref.
(N6q, N2; Ti, *V*)

99-N. Sigma-Phase Nucleation and Other Transformations During Diffusion in the Iron-Chromium System. H. J. Goldschmidt. Paper from "Mechanism of Phase Transformations in Metals". Institute of Metals, 1956, p. 105-119.

X-ray study of the progress of diffusion in powder compacts of iron and chromium for various temperatures, times and compositions. It has been possible to determine in this way the rate of solid-solution formation; in addition, some features observed are traced to a condition to the alpha lattice corresponding to incipient sigma formation or to a retarding influence of the gamma→alpha transformation upon diffusion. 13 ref. (N1; Fe, Cr, 6)

100-N. Martensitic Transformations. B. A. Bilby and J. W. Christian. Paper from "Mechanism of Phase Transformations in Metals". Institute of Metals, 1956, p. 121-172.

Definition of martensitic reactions should be based on the experimental observation of a change of shape in the transformed regions. Available crystallographic and kinetic data for all transformations of this type are reviewed. The nucleation process, and the possible roles of dislocations in these transformations, discussed. 166 ref. (N6q, N2)

101-N. Nucleation Problem in Martensite. M. A. Jaswon. Paper from "Mechanism of Phase Transformations in Metals". Institute of Metals, 1956, p. 173-185.

An outline of the dislocation-source theory of martensite nucleation, which is compared with the classical theory of Fisher, Hollomon and Turnbull. 48 ref. (N2, N6q)

102-N. Homogeneous Versus Heterogeneous Nucleation in the Martensitic Transformation. Larry Kaufman and Morris Cohen. Paper from "Mechanism of Phase Transformations in Metals". Institute of Metals, 1956, p. 187-191.

Determination of the M_s temperature of a series of iron-nickel alloys in order to decide whether the martensitic transformation is nucleated homogeneously or heterogeneously. 4 ref. (N6q, N2; Fe, Ni)

103-N. The Allotropic Transformation of Cobalt. Francois Sebilleau and Hervé Bibring. Paper from "Mechanism of Phase Transformations in Metals". Institute of Metals, 1956, p. 209-217.

Study of the behavior of cobalt after cold working has shown that recrystallization begins below the transformation temperature. This recrystallization takes place in two ways, depending on whether or not it is preceded by recovery of the metal. If not, the cobalt partially recrystallizes to the cubic form, and this cannot revert to the hexagonal form. On the other hand, metal which has previously undergone recovery recrystallizes completely in the hexagonal form. 15 ref.
(N5f, N6p; Co)

104-N. The Diffusionless Transformations of Metastable Beta-Brass. D. Hull and R. D. Garwood. Paper from "Mechanism of Phase Transformations in Metals". Institute of Metals, 1956, p. 219-227.

A metallographic study of two types of diffusionless transformation in metastable beta brass. The decomposition into "massive alpha"

occurs during quenching in alloys of a critical composition (36.8-39.0% zinc). This transformation has the characteristics of a nucleation-and-growth reaction. 15 ref. (N6; Cu-n)

105-N. Crystallography of the Beta →Alpha Phase Transformation in Uranium-1.4 Atomic Per Cent Chromium Alloy. B. R. Butcher and A. H. Rowe. Paper from "Mechanism of Phase Transformations in Metals". Institute of Metals, 1956, p. 229-242.

Orientation relationships in the isothermal martensitic change of the beta phase to alpha phase in a uranium-1.4 at. % chromium alloy, using both a single-surface and a two-surface technique. By means of an X-ray Laue microbeam camera and micrographic work, two orientation relationships between the beta and alpha phases have been found. 17 ref. (N6q; U, *Cr*)

106-N. The Beta→Alpha Transformation in Uranium 1.4 Atomic Per Cent Chromium Alloy. W. M. Lomer. Paper from "Mechanism of Phase Transformation in Metals". Institute of Metals, 1956, p. 243-252.

A certain homogeneous strain can be found which will convert a single unit cell of beta-uranium into the same shapes as a small block of alpha-uranium structure. The actual atomic positions within this unit block require adjustment to complete the transformation. 9 ref. (N6q; U, *Cr*)

107-N. Stabilization of Austenite. S. G. Glover and T. B. Smith. Paper from "Mechanism of Phase Transformation in Metals". Institute of Metals, 1956, p. 265-276.

Investigation of the thermal stabilization of austenite after partial transformation to martensite for a 1% carbon, 3% manganese steel. 37 ref. (N8p, AY, *Mn*)

108-N. X-Ray Determinations of Order and Atomic Sizes in Co-Pt Solid Solutions. P. S. Rudman and B. L. Averbach. *Acta Metallurgica,* v. 5, Feb. 1957, p. 65-73

The equilibrium long-range order in the alloy cobalt-platinum has been determined by means of X-ray intensity and lattice tetragonality measurements on powder briquettes quenched from various annealing temperatures. An elastic theory is used to determine the average atomic dimensions in solution from the lattice parameters and the bulk moduli. This result is then combined with the measured size-effect coefficients to provide information on the distortion of the shape of the atoms in solid solution. (N10a, M25m; Co, Pt, 14-17)

109-N. Self-Diffusion in Dilute Binary Solid Solutions—II. E. W. Hart, R. E. Hoffman and D. Turnbull. *Acta Metallurgica,* v. 5, Feb. 1957, p. 74-76.

Diffusion phenomena in dilute silver solid solutions may be considered to consist of matrix of undisturbed solvent containing nonoverlapping "soft" regions around each solute atom. (N1d; Ag)

110-N. Strain-Aging of Aluminum Liquid-Air Temperatures. A. R. C. Westwood and T. Broom. *Acta Metallurgica,* v. 5, Feb. 1957, p. 77-82.

Measurements of increases in flow stress of polycrystalline superpure aluminum and aluminum-magnesium alloys following aging at liquid-air temperatures after prior deformation at the same temperatures indicate that some form of strain-aging occurs. 4 ref. (N7e, 1-13; Al, *Mg*)

111-N. Grain Growth in Metals. P. Feltham. *Acta Metallurgica,* v. 5, Feb. 1957, p. 97-105.

The sizes and shapes of grains in annealed metals, characterized respectively by the grain diameters and the interfacial angles, are shown to be lognormally distributed in planar sections as well as in space. The similarity of the size and shape distribution facilitates the treatment of grain growth as a univariant statistical problem in which the mean rate of growth of the grains is obtained as the resultant of the surface tension-controlled rate of growth of the individual grains in the distribution. (N3m)

112-N. Influence of Impurities on the Macromosaic Structures of Tin and Lead. H. A. Atwater and B. Chalmers. *Canadian Journal of Physics,* v. 35, Feb. 1957, p. 208-215.

The properties and characteristics of arrays of low-angle boundaries which appear upon freezing of single crystals of tin and lead from the melt are shown to be dependent upon the amount and kind of impurities in the freezing liquid. The boundary direction angle as a function of lattice orientation and impurity as an observational quantity. Measure-

ments of boundary-direction are given for various impurity concentrations and types.
(N12n, N12r, 3-19; Sn, Pb)

113-N. Studies on Electrolytic Condenser (Part 21). Studies on Deterioration of Anodic-Oxidized Film of Aluminum in Electrolyte by Electron Microscope. Ichiro Sate. *Denki Kageku,* v. 24, Nov. 1956, p. 506-511.

Examination with electron and photomicroscopes to study the deterioration of electrolytic condensers during storage. The transformation of the surface film by immersion in electrolyte. 10 ref.
(N12d, M21e; Al, 14-12)

114-N. Strain Ageing of Boron-Treated Low-Carbon Steels. E. R. Morgan and J. C. Shyne. *Iron and Steel Institute, Journal,* v. 185, Feb. 1957, p. 156-160.

The efficiency of boron additions and commercial box annealing in suppressing nitrogen and carbon strain aging in alloys of commercial composition has been investigated. Results show that for all practical purposes boron-treated, box-annealed, low carbon steels containing from 0.007 to 0.02% boron are nonaging. 13 ref. (N7e; CN-g, *B*)

115-N. The Structure, Deformation, and Fracture of Pearlite. Part I. Structure. K. E. Puttick. *Iron and Steel Institute, Journal,* v. 185, Feb. 1957, p. 161-167.

Some features of pearlite structure revealed by electron microscopy are described and discussed. These include (a) a fine precipitate in the ferrite, formed after an aging treatment, of dimensions and spacing approximately 100Å, (b) inhomogeneity in the cementite shown by the rimmed appearance of etched lamellae, (c) branched crystallization of cementite, (d) linear discontinuities in the lamellar pattern, (e) bent and curved plates of cementite within a colony, (f) rod-like growth of cementite, (g) growth of cementite round inclusions. 17 ref. (N8h)

116-N. The Solubility of Nitrogen and Formation of Silicon Nitride in Iron-Silicon Alloys. E. T. Turkdogan and S. Ignatowicz. *Iron and Steel Institute, Journal,* v. 185, Feb. 1957, p. 200-206.

Iron-silicon alloys containing 0.90, 1.26 and 2.83% silicon have been equilibrated with ammonia-hydrogen or nitrogen-hydrogen mixtures at various temperatures. The solubility of nitrogen in iron, in equilibrium with a nitride phase, is reduced appreciably by the formation of a silicon nitride. The inclusions in the nitrided alloys have been extracted and analysis shows that they consist of silicon nitride and silica; the latter forms during the extraction operation from the silicon in solid solution. 11 ref. (N16m; Fe, *Si*)

117-N. Isothermal Transformation of Lamellar Pearlites to Austenite. M. M. Labib, A. A. Golestaneh, C. Handford and G. Bullock. *Iron and Steel Institute, Journal,* v. 185, Feb. 1957, p. 207-215.

The isothermal transformation of lamellar pearlites to austenite in a plain carbon eutectoid steel at supercritical temperatures examined using an electrical resistance technique. Relationship between interlamellar spacing, temperature and rate of transformation investigated and equations which express this relationship formulated. 23 ref.
(N8f; CN)

118-N. Effect of Structural Defects in Germanium on the Diffusion and Acceptor Behavior of Copper. C. S. Fuller and J. A. Ditzenberger. *Journal of Applied Physics,* v. 28, Jan. 1957, p. 40-48.

Effect of dislocations in germanium upon the diffusion of copper using germanium crystals having different etch-pit counts, as well as on germanium specimens bent on a (112) axis. (N1, P15g, M26b; Cu, Ge)

119-N. Self-Diffusion of Silver Palladium Alloys. N. H. Nachtrieb, J. Petit and J. Wehrenbert. *Journal of Chemical Physics,* v. 26, Jan. 1957, p. 106-109.

The self-diffusion of silver in alloys containing 0.00, 1.49, 3.69, 9.87 and 21.84 at. % palladium at four temperatures: 715.4, 799.4, 861.8 and 942.0° C. 11 ref. (N1d, 2-11; Ag, Pd)

120-N. Diffusion and Electrical Behavior of Zinc in Silicon. C. S. Fuller and F. J. Morin. *Physical Review,* v. 105, Jan. 15, 1957, p. 379-384.

Zinc has been diffused into silicon single crystals and elimination of diffusion constant and solubility have been obtained by conductivity measurements. Hall effect and conductivity measurements as functions of temperature have been made on silicon crystals containing diffused zinc. (N1b, P15g; Zn, Si)

121-N. Nucleation-and-Growth Processes in Metals and Alloys, H. K. Hardy and T. J. Heal. Paper from "Mechanism of Phase Transformations in Metals". Institute of Metals, 1956, p.1-46.

Examples of the thermodynamic-composition relationships underlying typical nucleation processes. The thermodynamics and kinetics of precipitation. Current information on the effect of plastic deformation on nucleation process. 194 ref. (N2, N7)

122-N. Effects of Nucleation Site Upon Precipitate Morphology. H. I. Aaronson. Paper from "Mechanism of Phase Transformations in Metals". Institute of Metals, 1956, p. 47-66.

Demonstration of two types of effects based on a metallographic investigation of pro-eutectoid ferrite morphologies in a plain carbon steel. A qualitative explanation in terms of interactions of the grain-boundary structure with the earliest stages of growth process. The second group of effects acts through a base layer of grain-boundary allotriomorphs and seems to determine the probability of secondary sideplates or secondary sawteeth developing from the allotriomorphs. 11 ref. (N2, N7)

123-N. Superlattice Formation in the Alloy $CdMg_3$. H. Steeple and H. Lipson. Paper from "Mechanism of Phase Transformations in Metals". Institute of Mteals, 1956, p. 77-85.

The optical-diffraction method of illustrating the process of superlattice formation in alloys, and some examples of diffraction patterns. It is shown that superlattice formation can be regarded as a process whereby similar atoms distribute themselves as evenly as possible on the lattice sites. 18 ref. (N10, 1-4; Cd, Mg)

124-N. The Beta→Alpha Transformation in Pure Tin and Its Dilute Alloys. E. O. Hall. Paper from "Mechanism of Phase Transformations in Metals". Institute of Metals, 1956, p. 87-92.

The mechanism whereby gray (alpha) tin disintegrates into small pieces as a result of the volume change on transformation. Compact pieces of gray tin can be produced by causing dilute alloys of tin to transform. 11 ref. (N6p, P10d; Sn)

125-N. Crystal Geometry of the Austenite-Martensite Transformation. T. L. Richards and W. T. Roberts. Paper from "Mechanism of Phase Transformations in Metals". Institute of Metals, 1956, p. 193-207.

For the purpose of analysis of the austenite-martensite transformation, it is assumed that transformation is equivalent to a combination of the simple Bain mechanism and a body rotation. 12 ref. (N8p)

126-N. The Bainite Reaction in High-Carbon Steels. O. Krisement and F. Wever. Paper from "Mechanism of Phase Transformations in Metals". Institute of Metals, 1956, p. 253-263.

Investigation of the influence of the precipitation of carbide in austenite on the bainite reaction in high-carbon steels. For higher carbon concentrations, formation of bainitic ferrite becomes possible adjacent to the surface of growing carbide particles, but it cannot form in an austenitic matrix of average carbon concentration. 18 ref. (N8m; CN-r)

127-N. (English.) **Chi Phase (Fe_2C) in Tempering Carbon Steels.** Minoru Okada and Yoshiaki Arata. *Osaka University, Technology Reports,* v. 6, Mar. 1956, p. 145-154.

In tempering of quenched carbon steels, the carbide existing in early part of the third stage has been investigated by means of magnetic analysis, graphitization test and X-ray diffraction test. As the result of these tests, the existence of the so-called chi phase has been confirmed. 10 ref. (N8a, 1-4; CN)

128-N. (French.) **On the Existence of a Plastic Deformation of Iron During the Transformation Alpha to Gamma and Gamma to Alpha.** Pierre Lehr. *Comptes Rendus,* v. 244, Jan. 2, 1957, p. 77-80.

Notes the existence of a plastic deformation of iron in the course of the transformation alpha to gamma and gamma to alpha which is indicated by photomicrographic study. Characteristics of this deformation. 7 ref. (N6p, Q24; Fe)

129-N. (Russian.) **Electron Diffraction Investigation of the Structure of Germanium Films Obtained by Vacuum Deposition.** S. A. Semiletov. *Kristallografiya,* v. 1, no. 5, 1956, p. 542-545.

Structure of germanium films deposited by sublimation in vacuum investigated and effects on this structure of the surface on which the film was deposited, temperature of

this surface, rate of deposition, and thickness of the film studied. The fact that various types of orientation of microcrystals of germanium in films are possible was established. (N15g, 1-23; Ge, 13-12)

130-N. Metallographic Study of Electroplated Coatings of Chromium and Nickel on Molybdenum. R. J. Runck. *Electrochemical Society, Journal,* v. 104, Feb. 1957, p. 74-79. (CMA)

A metallographic study of single and multiple-layer electroplates of nickel and chromium on molybdenum showed that the latter electroplates in single layers were less subject to bonding failure and gave a better defense against oxidation; cracking was the main cause of failure. Multiple-layer coatings in which chromium is plated first may be superior, but blisters between coats are a hazard. 5 ref. (N12d, L17; Mo, *Ni, Cr*)

131-N. Structure of Chemically Deposited Nickel. A. W. Goldenstein, W. Rostoker, F. Schossberger and G. Gudzeit. *Electrochemical Society, Journal,* v. 104, Feb. 1957, p. 104-110.

Analysis of the structure of the nickel deposit produced by the catalytic nickel reduction process. X-ray and electron diffraction; metallographic examination, etching, platings, growth faults. 10 ref. (N12d, Ni)

132-N. (French.) **Observation of an Isothermal Change of Phase in Titanium at High Temperature.** Micheline Sorel-Sternberg. *Comptes Rendus,* v. 244, Feb. 4, 1957, p. 765-767. (CMA)

Cinematographic recording of emission electron microscope images of titanium crystals undergoing phase transformations is described. The experiments, performed at a constant temperature of 1200° C. and lasting a few hours, showed that the surface of crystals of beta titanium, originally uniform, was gradually covered by a net of growing V needles composed of a precipitate. Since the velocity of the process depended on the degree of the vacuum in the microscope, the phenomenon was interpreted as due to phase transformations in titanium-gas systems, principally the system titanium-oxygen. The needles represented α series in the transformation sequence beta→alpha + beta→alpha where alpha and beta are, respectively, solid solutions of oxygen in alpha and beta titanium. (N7c, 2-12, 1-4; Ti)

133-N. (Report.) **A Critical Review of the Mechanism of Aging in Alloys Based on the Aluminum Zinc-Magnesium System.** I. J. Polmer. *Australian Aeronautical Research Laboratories,* report ACA-59, Aug. 1955, 22 p.

Available literature concerning the effect of age hardening on the changes in structure and properties in alloys of the 75S type. Effect of addition elements, changes in microstructure according to X-ray investigations. (N7a; Al, *Zn, Mg*)

134-N. Nucleation of Voids in Metals During Diffusion and Creep. R. Resnick and L. Seigle. Sylvania Electric Products, Inc. *U.S. Atomic Energy Commission,* SEP-213, May 24, 1956, 35 p.

Voids formed during diffusion in brass are heterogeneously nucleated. The nuclei appear to be oxide particles, probably zinc oxide. When these are removed by re-melting, voids practically do not exist upon subsequent dezincification. Brass freed of void nucleation catalysts exhibited increased stress-rupture life. 18 ref. (N2, N1e, Q3m; Cu-n)

135-N. Morphology of Zircaloy-2. M. L. Picklesimer and G. M. Adamson, Jr. *U.S. Atomic Energy Commission,* TID-7526 (Pt. 1), Feb. 1957, p. 165-185. (CMA)

The microstructures obtained from heat treating Zircaloy-2 were studied. Cooling rates affect the transformation and annealing time and temperature affects the beta quenched structure. Growth is slow for grains of alpha once they are equiaxed and for beta grains in all-beta structures. Intermetallic stringers are almost all dissolved in 30 min. at 1000° C. Beta structures differ in little but the size of the acicular alpha needles and the presence of intermetallics at grain boundaries, regardless of air or furnace cooling, water quenching or isothermal transformation. The preferred orientation is partially randomized by cold working water-quenched beta. (N6p, 2-14; Zr)

136-N. (Book.) **The Mechanism of Phase Transformations in Metals.** 346 p. 1956. Institute of Metals, 17 Belgrave Square, London S.W.1, England.

The 18 papers of the symposium are abstracted separately. The symposium is divided into two parts, one dealing with nucleation and growth processes and the other with martensitic transformations. (N2, N6q)

137-N. Grain Growth in Steels. Role of Aluminium Nitride (Pt. 2). A. B. Chatterjea and B. R. Nijhawan. *Metal Treatment and Drop Forging,* v. 24, Feb. 1957, p. 54-60.

Analysis of published information and supplementary data obtained indicated aluminum nitride as a grain-growth inhibitor accounting for austenitic grain-refining characteristics of aluminum-killed steels. (N3; ST-c)

138-N. The Periodicity of Dissociation of Solid Solutions. *Metal Treatment and Drop Forging,* v. 24, Feb. 1957, p. 70-71.

Dissociation of austenite in steel under isothermal heating and the periodic variation in hardness values. (N8g, Q29n; ST)

139-N. Production of Thorium-Bismuth Dispersions. J. S. Bryner, R. J. Teitel and M. B. Brodsky. Paper from "Metallurgical Information Meeting, Ames Laboratory", May 1956. *U.S. Atomic Energy Commission,* TID-7526 (Pt. 1), Feb. 1957, p. 103-114.

Methods by which dispersions of equiaxed particles of thorium bismuthide in liquid bismuth have been produced on a laboratory scale. These methods include various modifications of the reaction of solid thorium with liquid bismuth and a new method by which the dispersions can be produced from a solution of thorium in liquid bismuth. (N12; Th, Bi)

140-N. Morphology of Zircaloy-2. M. L. Picklesimer and G. M. Adamson, Jr. Paper from "Metallurgical Information Meeting, Ames Laboratory", May 1956. *U.S. Atomic Energy Commission,* TID-7526 (Pt. 1), Feb. 1957, p. 165-185.

Zircaloy-2 specimens were given a wide variety of conventional heat treatments. The microstructures show the effect of cooling rates on the beta to alpha transformation, effect of annealing time and temperature on the beta quenched structure, development of a partially randomizing heat treatment, grain growth in the alpha and beta phases. The microstructure of a multiphase weld is shown and compared to the conventionally heat treated structures. (N6p, M27, 2-14; Zr)

141-N. (French.) **Structure of Tin Deposits Obtained by Electrolysis.** J. J. Trillat, S. C. Britton, K. Mihama and S. Barbezat. *Metaux-Corrosion-Industries,* v. 32, Jan. 1957, p. 1-9.

Analyzes structure of electrolytic deposits of tin by means of an electron microscope and by X-ray diffraction; experimental techniques employed; close relationship is noted between the orientation of the deposits. 7 ref. (N12d, M21e, M22g; Sn)

142-N. (German.) **Formation of Coarse-Grained Aluminum With Trace Elements.** F. Erdmann-Jesnitzer and H. Schönberg. *Aluminium,* v. 33, Jan. 1957, p. 6-15.

Recrystallization experiments on high-purity aluminum containing small quantities of alloying element described to show whether these elements affect the deformed crystal structure through diffusion. 34 ref. (N5, 1-10; Al-a)

143-N. (Italian.) **Electron Microscope Examination of Hardening Phases in a Binary Al, 5% Cu Alloy.** M. Paganelli and E. Dalle Nogare. *Alluminio,* v. 26, Feb. 1957, p. 51-58.

In naturally aged alloy an increase occurs in number of "white points", corresponding to Guinier-Preston zones, as length of aging period increases. In same alloy artificially aged at 190° C., the $CuAl_2$ phases were observed. 29 ref. (N7a; Al, *Cu*)

144-N. (Italian.) **Polymorphism of Metals and Influence of Alloying Elements on Same.** W. Köster. *Metallurgia Italiana,* v. 49, Jan. 1957, p. 14-23.

Nature and identification of polymorphism; mechanism of transformation; influence of additions; iron, cobalt and titanium alloy transformations; polymorphism of manganese. 16 ref. (N6p, 2-10; Fe, Co, Ti, Mn)

145-N. (Spanish.) **Influence of Vanadium on Susceptibility to Austenitic Grain Growth.** Justo Ferrer Flotats. From "Papers Presented at the 3rd General Assembly of the Iron and Steel Institute". 1956, 10 p.

Comparative study made on nine steels of different origins by tracing their respective curves and making photomicrographs of given singular points on same. Vanadium steels showed reduced susceptibility to grain growth from overheating and a smaller initial grain. 10 ref. (N3, 2-10; AY, *V*)

146-N. Origin of Graphite in Cast Irons. (Pt. 2). J. E. Harris and V. Kondic. *Foundry Trade Journal,* v. 102, Mar. 7, 1957, p. 311-314.

Discussion of experimental results. Evidence indicates graphite shapes and distributions observed to form in hypo-eutectic cast irons during normal process of solidification can be produced by decomposition of iron carbide in solid state, lending support to indirect hypothesis for origin of graphite. (N8s; CI)

147-N. Pearlite-Austenite Change. Conversion by Heating Effect of Electric Current. P. G. Morgan. *Iron and Steel,* v. 30, Mar. 1957, p. 108.

Brief note on alpha to gamma conversion in carbon steel by heating effect of electric current giving temperature elongation and electrical resistance changes. (N8h, 16-11; ST)

148-N. Carbide Precipitation in Tungsten-Chromium Steels Below 700° C. Kehsin Kuo. *Iron and Steel Institute Journal,* v. 185, Mar. 1957, p. 297-303.

X-ray and chemical analyses were carried out on carbides extracted electrolytically from steels containing up to 15% tungsten and 12% chromium. All these carbides were derived from the respective carbides in tungsten and chromium steels. Carbide phase-changes discussed in terms of the compositions of the matrix and the carbides. 21 ref. (N7; AY, *Cr, W,* 14-18)

149-N. Nature of Ageing of Binary Iron-Chromium Alloys Around 500° C. R. O. Williams and H. W. Paxton. *Iron and Steel Institute Journal,* v. 185, Mar. 1957, p. 358-374.

Investigation of aging (475° C. embrittlement) of iron-chromium alloys carried out using electrical resistance, hardness, magnetic measurements, and X-ray difraction. On the basis of this work it is concluded that a miscibility gap exists below 600° C. and is joined by one or two eutectoid reactions to the sigma-forming regions. Chemical and/or magnetic energies may be responsible for the gap and perhaps account for the odd shape. 37 ref. (N7a, Q26s; Fe, *Cr*)

150-N. Observation of Phase Transformation by High Temperature Microscopy. Kazuo Zutani. *Japan Society of Mechanical Engineers, Journal,* v. 60, Feb. 1957, p. 162-168.

Observation of martensite transformation, pearlite transformation and bainite transformation by means of high-temperature microscopy. From the results of the observations the bainite transformation appears to be controlled by the diffusion of carbon atom. (N8, M21, 2-12; ST)

151-N. (French.) **Development During Heating of Martensite of Thermal Origin in Steels of 18% Chromium, 2, 4 or 6% Nickel and 0.05% Carbon.** Paul Bastien and Alain Sulmont. *Comptes Rendus,* v. 243, Dec. 17, 1956, p. 2065-2068.

Two steps are distinguished, one consisting of a decomposition of the martensite in two phases, alpha and gamma, and the other the dissolving of the alpha by gamma. 4 ref. (N8p; SS)

152-N. (Japanese.) **Some Consideration on the Aging of Steel and Iron.** Shigeo Zaima and Sadaharu Mitsuishi. *Japan Society of Mechanical Engineers, Transactions,* v. 23, Feb. 1957, p. 108-110.

Change of magnetic properties with time in 1.29% carbon steel, 0.304% carbon steel and pearlite cast iron which was tempered between 100 and 300° C. with 50° C. intervals. Table of hysteresis loss shown. (N27a, P16; CN, CI)

153-N. (French.) **Study by Electron Diffraction of the Formation of Aluminum-Antimony Alloys in Thin Layers.** Pierre Michel. *Comptes Rendus,* v. 243, Dec. 17, 1956, p. 2063-2065.

The structure of thin layers of aluminum-antimony layers, obtained by simultaneous and successive evaporation of the constituent pure metals, was studied by means of electron diffraction. (N16n, M21e; Al, Sb, 14-12)

154-N. (French.) **X-Ray Study of Precipitation Phenomena in the Aluminum-Zinc-Magnesium Alloy Containing 9% Zinc and 1% Manganese (AZ9G1).** René Graf. *Comptes Rendus,* v. 245, Jan. 14, 1957, p. 337-340.

Investigation of the aging process by X-ray diffraction. At ordinary temperatures pre-precipitation phenomena due to spherical-shaped zones are observed. This precipitation leads to the $MgZn_2$ phase. (N7b, M22g; Al, *Mg, Zn*)

155-N. (French.) **Faraday's Law Applied to the Anodic Dissolution of Metals.** I. Epelboin and M. Froment. *Métaux-Corrosion-Industries,* v. 32, Feb. 1957, p. 55-72.

Such an application permits the determination of the number of elec-

trons exchanged with the outer circuit and facilitates consideration of the structure of the double electrochemical film. Experimental techniques; anodic dissolution of aluminum, beryllium, magnesium and zinc; use of electrolytic polishing. 49 ref. (N12d, L19, L13p)

156-N. (German.) **Non-Martensitic Structure of an Fe-Mn-C Alloy After Quenching at 1150° C. and Subsequent Deep-Cooling.** A. Masin, D. Tlusta and M. Mrazek. *Acta Technica Academiae Scientiarum Hungaricae,* v. 16, 1957, p. 205-209.

Presents an as yet unknown structural element, different from needle-shaped martensite, established besides normal martensite, in an alloy of 94% iron, 5% manganese and 1% carbon, after quenching at 1150° C. and subsequent deep-cooling. (N8; *Fe,* Mn, C)

157-N. The Effect of Aluminium Nitride Precipitation in Relation to Grain Growth in Steels. A. B. Chatterjea and B. R. Nijhawan. *Indian Institute of Metals, Transactions,* v. 8, 1954-55, p. 225-251.

Existing information on the grain growth in metals and alloys surveyed. In aluminum deoxidized steel, it has been established that there is range of residual aluminum concentration for maximum grain growth inhibition. Hypotheses based on aluminum oxide, residual aluminum, surface adsorption, aluminum sulphide and aluminum nitride as inhibitors of austenitic grain growth have been critically examined. (N3m, N7; ST)

158-N. Studies on Tempering of Carbon Steel Samples by Thermo-Electromotive Forces. J. K. Mukherjee and G. P. Chatterjee. *Indian Institute of Metals, Transactions,* v. 8, 1954-55, p. 217-224.

Changes occurring in the tempering of a quenched steel are the result of the tendency of non-equilibrium strained phases to transform into stable strain-free aggregate of ferrite and carbide. An attempt has been made to study the changes in the thermo-electromotive forces values of quenched samples of carbon steel on tempering at comparatively lower temperatures (50 to 75° C.) for different periods of time. (N8a, P15p; Cn)

159-N. Grain Growth of Titanium Carbide in Nickel. L. P. Skolnick. *Journal of Metals,* v. 9, no. 4, Apr 1957, p. 438-442. (CMA)

The grain growth of TiC in liquid nickel studied by the infiltration method. The grain growth occurred by formation of idiomorphic grains, followed by spheroidization and rapid growth, and, finally, coalescence and closer packing of the grains. Grains appear to grow mainly by dissolution of high energy surfaces, transport of TiC through liquid and isothermal redeposition. (N3; Ni, *Ti,* 1418)

160-N. Computation of M_s for Stainless Steels. F. C. Monkman, Frank B. Cuff, Jr., and N. J. Grant. *Metal Progress,* v. 71, Apr. 1957, p. 94-96.

A new attempt at a linear relationship between M_s temperature and composition in nickel-bearing stainless steels has been made which shows a small improvement over a formerly published equation. Because of the complex interactions of alloying elements, further improvement by first-order equations is not to be expected. (N8p, 1-4; SS)

161-N. The Effect of Cooling Rate on the Nucleation and Growth of Beta-Uranium Hydride in Metallic Uranium. H. R. Gardner and J. W. Riches. General Electric Co. *U.S. Atomic Energy Commission* HW-43428, Oct. 12, 1956, 28 p.

The Jominy end-quenching technique was applied to uranium specimens to study the effect of cooling rate on the nucleation and growth characteristics of beta-uranium hydride in metallic uranium. For cooling rates ranging from 0.002 to 300° C. per sec., it was determined that uranium hydride nucleated primarily at grain boundaries either as discrete particles or in conjunction with carbide-type inclusions. (N2, 3-17; U)

162-N. Grain Size Control in Titanium and the Effect Thereon of Various Addition Agents. Y. C. Liu and H. Margolin. Watertown Arsenal Laboratory, Report 401/105/16, Pt. 1. *U.S. Office of Technical Services,* PB 124519, Nov. 1952, 53 p. (CMA)

Alloying additions do not affect the recrystallization temperature of iodide titanium much. The alpha grain size can be refined by deformation and annealing. Recrystallizing in the alpha-beta field refines the alpha grain size of alloys with 0.1-0.5% addition. Starting structure

had little effect on the recrystallized grain size. The activation energy of recrystallization was computed for Ti-0.5C, Ti-0.5V, Ti-0.1Al and Ti-0.5Al. (N5, M27c, 2-10; Ti)

163-N. Study of Freezing Segregation in Titanium Alloy Ingots. J. W. Holladay. Battelle Memorial Institute. Report 62. *U.S. Office of Technical Services,* PB 121606, Jan. 1957, 52 p. (CMA)

Nonuniformities in the mechanical properties and nonhomogeneity in the composition of titanium alloy parts were studied to discover if these faluts were due to freezing segregation. The results of the theoretical analysis are compared with the limited experimental data. (N12, 9-19; Ti)

164-N. (French.) **Restoration and Recrystallization of Zirconium and Its Alloys in Relation to Their Cold Working.** Jean Hérenguel, Donald Whitwham and Jacques Boghen. *Comptes Rendus,* v. 244, Mar. 4, 1957, p. 1370-1372. (CMA)

Experiments on the restoration and recrystallization of cold worked unalloyed zirconium and an industrial zirconium alloy (1.5% Sn, 0.15% Fe, 0.05% Ni and 0.01% Cr) by heating in air indicated two types of suitable tempering treatments: the usual recrystallization, limiting the temperature to 550-575° C. and the time tc 30-15 min., in which the oxide film has a thickness of at most 2 μ; and a more or less complete restoration with gradually improving properties, in which the oxide film is also extremely thin. 3 ref. (N5, J23c; Zr)

165-N. (French.) **Precipitation Phase Followed by a Transitory Phase in the Isothermal Aging of a Nickel-Titanium Alloy.** Charlotte Bueckle and Jack Manenc. *Comptes Rendus,* v. 244, Mar. 18, 1957, p. 1643-1646. (CMA)

Three structural phases were confirmed by X-ray and micrographic observations of a nickel alloy with 9.26% titanium after isothermal aging subsequent to tempering: a precipitation phase, an unstable gamma prime-phase, and an equilibrium eta-phase. The occurrence of the three phases is comparable to that in aluminum-base alloys, although they occur at a much lower aging temperature (600° C.). 5 ref. (N7c; Ni, *Ti*)

166-N. (German.) **On Hot Working of Aluminium.** J. Schey. *Acta Technica Academiae Scientiarum Hungaricae,* v. 16, 1957, p. 131-152.

To clarify phenomena taking place in the hot working of aluminum, 99.5% aluminum test specimens, mostly cast, were upset, extruded and rolled at temperatures of 20-650° C. Specimens upset and rolled up to 70% reduction and those extruded at 94% reduction in area showed no recrystallization during hot working. In hot worked specimens recrystallization took place during subsequent heating. (N5, F23, 1-16; Al)

167-N. (Russian.) **Recrystallization Diagram of Iodide Zirconium.** E. M. Savitskii and V. F. Terekhova. *Akademiya Nauk S.S.S.R. Doklady,* v. 112, Jan. 11, 1957, p. 276-278. (CMA)

Recrystallization in cold worked and annealed iodide zirconium was investigated, and the results are presented in a three-dimensional diagram giving the average size of recrystallized grains as a function of both the degree of deformation (2.5-90% compression on rolling) and the temperature of annealing following rolling (500-1200° C.). The main phenomenon is the great increase in grain size at annealing temperatures corresponding to the alpha-beta transformation of zirconium. It is recommended that cold worked zirconium be annealed at 700-750° C., since at these temperatures the grain size increase is small and the recrystallization reconstitutes completely the pre-deformation structure. Moreover, articles made of zirconium do not oxidize appreciably at these temperatures, even if the annealing is done in air. 3 ref. (N5, N3; Zr)

168-N. (Russian.) **Dilatometric Investigation of the Behavior of Zirconium Dioxide and Its Solid Solutions With Calcium and Magnesium.** E. K. Keler and A. B. Andreeva. *Ogneupory,* v. 22, no. 2, 1957, p. 65-71. (CMA)

Polymorphic transformations of zirconium dioxide limit its possibilities as a highly refractory material. In a series of dilatometric observations, the authors studied these transformations and the stabilizing influence of oxide of calcium and magnesium. In zirconium dioxide calcined at 1700° C. the transformation begins at about 1000° C. (both in heating and cooling). Quenching after calcination partially stabilizes the tetragonal modification. Stabilized solid solutions 90 mol % ZrO_2 + 10 mol % GaO (or

MgO) are destabilized through decomposition into individual oxide phases by heating at 1200-1300° C.; the polymorphic transformation is shifted toward lower temperatures; volume change rate and porosity are increased, while mechanical strength decreases. Excess of stabilizer (e.g., 50% MgO) does not prevent the destabilizing decomposition on heating. 12 ref. (N6; Zr, Ca, Mg)

169-N. The Beta-Alpha Phase Change in Pure Uranium. B. R. Butcher. *Journal of Nuclear Energy,* v. 4, Mar. 1957, p. 273-278.

A review of the literature establishes that there is some controversy over the nature of the beta-alpha phase change in pure uranium. Crystallographic and metallographic experiments undertaken to clarify the position. 17 ref. (N6p; U-a)

170-N. Growth of Mercury Crystals From the Vapor. Gerald W. Sears. *New York Academy of Sciences, Annals,* v. 65, Apr. 11, 1957, p. 388-416.

The growth behavior of mercury "whiskers" and platelets from the vapor phase and explanation of their growth behavior. Growth kinetics for both whiskers and platelets lead to the conclusion that these crystals are nearly perfect. 37 ref. (N3r, N15g; Hg)

171-N. Diffusion in Metals. B. D. Cullity. *Scientific American,* v. 196, May 1957, p. 103-110.

Simple illustration of diffusion mechanism and theory. (N1c)

172-N. Investigation of Diffusion of Boron and Carbon Into Some Metals of the Transition Groups. G. V. Samsonov and V. P. Latysheva. *Henry Brutcher Translation* no. 3902, 11 p. (From *Fizika Metallov I Metallovedenie,* v. 2, no. 2, 1956, p. 309-312.) Henry Brutcher, Altadena, Calif.

Previously abstracted from original. See item 370-N, 1956. (N1, B, C)

173-N. (English.) **On the Period of Out-of-Step of Ordered Alloys With Anti-Phase Domain Structure.** Kunio Fujiwara. *Physical Society of Japan, Journal,* v. 12, Jan. 1957, p. 7-13.

The out-of-step period of ordered alloys with anti-phase domain structure, measured in atomic distance, is generally not an integer. This fractional property of the period has been examined theoretically. Results of numerical calculations in some models of arrangement have been suggested; however, complete regularity in arrangement is not always necessary, uniformity being essential only for the interpretation of the diffraction patterns. (N10, M27g)

174-N. (German.) **Stress-Relief and Recrystallization of Aluminum (New Investigations) Pt. 1.** D. Altenpohl. *Aluminium,* v. 33, Apr. 1957, p. 226-233.

Some typical examples of stress-relief and recrystallization in cold and hot worked aluminum semi-finished products; relationship between heterogeneous structures and recrystallization. The processes which occur during the heating of a cold worked metal are discussed. (N5, J1a; Al)

175-N. (German.) **Investigations of the Isothermal Time-Temperature Conversion Diagrams and the Quenching Hardenability of Steels.** Erich Greulich. *Archiv für das Eisenhüttenwesen,* v. 28, Feb. 1957, p. 91-100.

Plotting of isothermal time-temperature conversion diagrams of six steels with 0.16 to 0.72% C; 0.2 to 1.2% Si; 0.6 to 1.4% Mn; 0 to 1.6% Cr; 0 to 0.36% Mo; 0 to 1.5% Ni and 0 to 0.27% V. Natural logarithms of the shortest half-life period as hardenability value. Time-temperature conversion diagrams of previously investigated steels. 8 ref. (N8g, J5, AY)

176-N. (German.) **Investigation of the Isothermal Transformation of Copper-Chromium and Nickel-Chromium Cast Iron With 0.5% of Molybdenum.** Albert De Sy and J. Van Beghem. *Giesserei,* v. 44, no. 8, Apr. 11, 1957, p. 189-199.

Composition of the cast irons examined; determination of the transformation curves; results and their interpretation; examination of the effect of the alloy additions. (N8g; CI-q, *Cu, Cr, Ni, Mo*)

177-N. (German.) **Influence of the Admixture of Antimony on Aluminum Alloys.** W. Thury. *Metall,* v. 11, Mar. 1957, p. 190-192.

Precipitation of magnesium from aluminum-magnesium alloys in form of Mg_3Sb_2. Possibility of removal of magnesium from remelted scrap. 8 ref. (N7, 1-10; Al, *Mg, Sb*)

178-N. (German.) **Significance of Carbide Dissolution on Austenitizing and Its Effect on Transformation of Toolsteels.** Adolf Rose and Leo Rademacher. *Stahl und Eisen,* v. 77, Apr. 4, 1957, p. 409-421.

Austenitizing temperature and time; correlation between austenitizing and nucleation; effect on the transformation of steels; TTT-diagrams for two austenitizing temperatures of hypo-eutectoid, eutectoid and hypereutectoid toolsteels; hardenability and tempering behavior of these steels. (N8, J22; TS)

179-N. (German.) **Electron Microscopic Observations of the Allotropic Transition of Cobalt.** Otto Buhl and Claus Schüler. *Zeitschrift für Metallkunde,* v. 48, Mar. 1957, p. 116-118.

The beta-alpha phase-transition of cobalt is investigated in a pulse-field driven field electron microscope. 13 ref. (N6p, M21e; Co)

180-N. (Russian.) **Titanium, Its Alloys and Fields of Application.** N. T. Gudtsov and L. D. Mashtakova. *Akademiya Nauk S.S.S.R., Vestnik,* v. 27, Feb. 1957, p. 59-68. (CMA)

In a general description of properties of titanium, the problem of the thermal treatment of the metal and its alloys is discussed at some length. While some investigators recognize a general analogy between the thermal behavior of titanium systems and steels, other underline the differences and thus question the possibility of a strengthening quenching in the case of titanium alloys. The very rapid growth of crystal grains at high-temperatures is prevented by resorting to a preliminary deformation (e.g., rolling) which may be either hot (650-880° C.) or cold. High strength combined with a certain plasticity is obtained by rolling in the alpha + beta, quenching and annealing at 450-550° C. for a short time. The appearance of the brittle omega-phase at temperatures below the beta transformation and ways of avoiding its formation are also discussed. (N general; Ti)

181-N. **Thermal Diffusion of Hydrogen in Zirconium. Preliminary Report.** J. M. Markowitz and J. Belle. *U.S. Atomic Energy Commission,* WAPD-TM-42. Feb. 1957, 19 p. (CMA)

The thermal diffusion of hydrogen into Zircaloy was studied in an effort to explain the corrosion failure under certain irradiation conditions. Two theoretical approaches to the problem are explored and experimental data are applied to both. The complicating precipitation of a hydride phase is noted. Thermal diffusion curves are shown and discussed for different phase regions of the zirconium-hydrogen system. In the two-phase region the concentration of the matrix is governed by the solubility curve. (N1; Zr, *H*)

182-N. (French.) **Elements of the Structural Metallurgy of Titanium and Its Alloys.** Adrien Saulnier. *Revue de l'Aluminium,* v. 34, Mar. 1957, p. 271-276. (CMA)

Below 885° C. pure titanium exists in the hexagonal alpha-phase, and at 885° C. it changes over by allotropic transformation into the cubic beta-phase. Most titanium alloys are formed by mixtures of these two phases. Characteristic alloy formations are the Ti-Al, the Ti-Fe and the Ti-V types. On further processing, depending on the degree of stabilization of the beta-phase, rapid cooling will bring about the martensitic alpha′-phase (from weakly stabilized beta-phase) or (from the highly stabilized beta-phase) the submicroscopic omega-phase and alpha-phase oriented in Widmänstatten figures. (N6p; Ti)

183-N. **Strain Figures Appearing on the Surface of Copper Electrodeposits Subjected to Fatigue.** M. Suzuki. *Institute of Metals, Journal,* v. 85, Jan. 1957, p. 206-208.

Effects of microstructure of the underlying metal upon the flecks and strain figures appearing on the surface of electroplated copper subjected to fatigue were investigated. Flecks appear in the region of the grain boundaries of the metal beneath. Grain boundaries run parallel to the direction of the planes of the maximum shear stress. (N12d; Cu)

184-N. **Some Observations of the Effect of a Dispersed Oxide Phase on the Recrystallization of Copper.** J. W. Martin. *Metallurgia,* v. 55, Apr. 1957, p. 161-165.

Compares activation energy for recrystallization of specimens deformed and recrystallized under various conditions for pure copper, copper containing silicon in solid solution and copper containing dispersed silica particles; recrystallization followed microscopically and by hardness measurements. 28 ref. (N5f; Cu)

185-N. **Sigma Formation in Commercial Ni-Cr-Fe Alloys.** Francis B. Foley and Vsevelod N. Krivobok. *Metal Progress,* v. 71, May 1957, p. 81-86.

Formation of sigma phase in high chromium-nickel alloys of iron is usually blamed for embrittlement of the alloys after long heating, but there is reason to believe that some more subtle phenomenon is also a contributing factor.
(N8, Q6n, 3-18; SS)

186-N. Existence of a Metastable Phase Isomorphous With the Stable Phase of a Pure Metal. J. H. O. Varley. *Philosophical Magazine,* v. 2, 8th Ser., Mar. 1957, p. 384-388.

A study of the factors controlling the coefficient of volume expansion of a pure metal, in a previous paper, has led to the conclusion that there are two isomorphous states, differing only in volume, of any given crystal structure. The relative stabilities of these phases are discussed and the possibility of isomorphic transformations is examined. (N6)

187-N. (English.) **Diffusion of Hydrogen Through Iron and Binary Iron-Chromium and Iron-Nickel Alloys at High Pressures and Temperatures.** A. A. Shcherbakova. *Journal of Applied Chemistry of the USSR,* v. 29, June 1956, p. 955-960. (Translated by Consultants Bureau Inc., 227 W. 17th St., New York 11, N.Y.)

Diffusion of hydrogen in chromium and nickel at temperatures from 200 to 600° C. and under a pressure of 100 atmospheres. Investigation of exponential relationship between the diffusion rate and the absolute temperature. 6 ref.
(N1, 1-13, 3-24; Fe, *Cr, Ni, H*)

188-N. (English.) **Pressure-Induced Diffusion and Deformation During Precipitation, Especially Graphitization.** Mats Hillert. *Jernkontorets Annaler,* v. 141, no. 2, 1957, p. 67-83.

How pressure differences in binary systems are originated during solid-state precipitation processes; effect of such differences on the course of the process.
(N7b, M24b, 3-24)

189-N. (French.) **Structural Influence of Common Cast Irons on Their Elastic Behavior.** Paul Le Rolland and Elisabeth Plenard. *Fonderie,* no. 134, Mar. 1957, p. 105-112.

Structure of the most common foundry irons, with consideration being limited to gray iron with laminated graphite and a ferritic-pearlitic matrix. Effect of cooling rate through the graphitization range; influence of the graphite structure; influence of the nature of the matrix on elastic properties.
(N8s, Q21; CI-n)

190-N. Structure of Guinier-Preston Zones. Pt. II. Room-Temperature Aging of the Al-Cu Alloy. Karel Toman. *Acta Crystallographica,* v. 10, Mar. 10, 1957, p. 187-190.

Determination of the coefficients dependent on the structure of the zone from the variation of the diffuse intensity by the method of least squares for the natural aged aluminum-copper alloy. From these the concentration of copper atoms in various atomic planes of the Guinier-Preston zone, as well as the displacements of these planes with respect to the matrix, were determined. 3 ref. (N7a; Al, Cu)

191-N. Precipitation of Cu in Ge. A. G. Tweet. *Physical Review,* v. 106, Apr. 15, 1957, p. 221-224.

Kinetics of precipitation of copper from supersaturated solid solution in germanium studied as a function of temperature and dislocation density in the samples. Results can be expressed as an exponential decay with time of the unprecipitated fraction of copper. (N7b; Cu, Ge)

192-N. Isothermal Transformation in Relation to Heat Treatment of Steel. C. E. Mavrocordatos. *South African Institute of Mining and Metallurgy, Journal,* v. 57, Dec. 1956, p. 305-323.

Review of the mechanisms of transformation; suggestions for further experimentation. 42 ref.
(N8g; ST)

193-N. (English.) **On the Effect of Alloying Elements on the Solubility of Carbon in Molten Iron.** Koji Sanbongi, Masayasu Ohtani and Koshi Toita. *Tohoku University, Science Reports of the Research Institutes,* v. 9-A, Apr. 1957, p. 147-158.

The solubility of carbon in Fe-C-Si, Fe-C-Cr and Fe-C-Mn melts determined at 1540° C. Some considerations were made to generalize the effect of alloying elements on solubility, referring to the previous data on the solubility of carbon and nitrogen in iron melts. The factors which are responsible for these effects are discussed in relation to the periodic table.
(P12e, 1-10; Fe, *C*)

194-N. (Czech.) **Application of Micro-Analytical Methods in the Study of**

the Isothermal Decomposition of Austenite. Josef Cadek and Karel Mazanec. *Hutnické Listy,* v. 12, Mar. 1957, p. 216-222.

Basic suppositions and conceptions of the modern theory of nucleus formation and growth of a new phase; special attention is given to the problem of the existence of fluctuations as a basic cause of forming nuclei of a new phase; growth of a new phase is considered to be a process of forming two-dimensional nuclei. 28 ref. (N8g, 1-4; ST)

195-N. (Czech.) **Study of the Transformation of Delta Ferrite in Stainless Steels 18-9-Ti With High Titanium Content.** V. Cihal and M. Prazak. *Hutnické Listy,* v. 12, Mar. 1957, p. 236-242. (CMA)

Using austenitic steel with 18% chromium and 9% nickel the authors investigated the behavior of delta ferrite, a phase that appeared in the steel when titanium (up to 0.8%) was added. The procedure followed was to obtain potentiometric curves of a corrosive etching and to compare the results with microscopic and electron microscopic metallograms. It was observed that the transformation of the ferrite was a function of the thermal treatment. At temperatures of 550-800° C. delta ferrite decomposes according to the reaction $\delta \rightarrow$ carbides $+ \gamma + \sigma$, while above 800° C. the phase reaction is $\delta \rightarrow$ carbides $+ \gamma$. The presence of σ-phase impairs the readiness of the steel to undergo the secondary passivation and changes the course of the polarization curve in the transpassive region. 26 ref. (N8, 1-10; SS, *Ti*)

196-N. (Czech.) **Study of the Influence of Tungsten on the Magnitude of the Interlamellar Distance of Pearlite.** Karel Mazanec. *Hutnické Listy,* v. 12, Apr. 1956, p. 309-315.

On raising the content of tungsten from 0.42% to 1.50% the interlamellar distance increases about 42%. Tungsten probably raises the value of the coefficient of surface tension on the cementite (carbide)—ferrite intermediate phase and that of the coefficient of surface tension on the cementite (carbide)—austenite intermediate phase. 13 ref. (N8h, 1-10; AY, *W*)

197-N. (German.) **Strain Relief and Recrystallization of Aluminum. Pt. 2.** D. Altenpohl. *Aluminium,* v. 33, May 1957, p. 306-317.

Strain relief and recrystallization in pure and superpure aluminum, the results of which are interpreted in the light of present-day knowledge. Effects of rate of heating, degree of reduction in cold rolling, purity, various additions, hardening and nature of grain boundaries in superpure aluminum. 37 ref. (N5; Al-a)

198-N. (Italian.) **On the Solubility and Reprecipitation Mechanism of Graphite in Cast Iron.** V. Gottardi. *Metallurgia Italiana,* v. 49, Mar. 1957, p. 173-180.

Investigation of the solubility of graphite in the austenite of a ferritic spheroidal cast iron by microscopic observation and determination of microhardness. Study was made of the isothermal of graphitization occurring at 725° C. on lamellar and spheroidal pearlitic cast iron. 22 ref. (N8s; CI)

199-N. (Swedish.) **Decomposition of Delta Ferrite in High-Alloy Steels.** Kehsin Kuo. *Jernkontorets Annaler,* v. 141, no. 3, 1957, p. 146-174.

In Fe-M-C ternary systems, where M represents vanadium, chromium, molybdenum or tungsten, the delta-ferrite has an intermediate M content between those of the austenite and an alloy carbide; it is therefore possible for the former to decompose into an aggregate of the latter. This aggregate resembles pearlite in appearance when the transformation temperature is above 850° C., and the term delta eutectoid has been used to denote it. Below 850° C. the same aggregate very often displays an acicular appearance not unlike bainite. 32 ref. (N8; AY)

200-N. Growth of Zinc Whiskers. R. V. Coleman and G. W. Sears. *Acta Metallurgica,* v. 5, Mar. 1957, p. 131-136.

Zinc whisker growth studied by vapor deposition of a pure phase in the presence of an inert gas. 11 ref. (N15g; Zn)

201-N. Crystallography of Martensite Transformation. Pt. IV. Body-Centered Cubic to Orthorhombic Transformations. J. K. Mackenzie and J. S. Bowles. *Acta Metallurgica,* v. 5, Mar. 1957, p. 137-149.

Theoretical predictions of habit planes, orientation relationships and directions of the homogeneous strain compared with available experimental data and found to be in satis-

factory agreement for transformations in Cu_3Al, AuCd and Ti. 27 ref. (N6q; Cn, Al, Au, Cd, Ti)

202-N. Diffusion in Multicomponent Metallic Systems. J. S. Kirkaldy. *Canadian Journal of Physics,* v. 35, Apr. 1957, p. 435-440.

Onsager's phenomenological scheme for diffusion in multicomponent liquid systems is examined for suitability as a description of metallic interdiffusion. Subject to certain restrictions and approximations, a set of nonlinear differential equations is obtained which can be simply applied to important boundary conditions. 9 ref. (N1b)

203-N. Diffusion of Nickel in Nickel Oxide. Moon Taik Shim and Walter J. Moore. *Journal of Chemical Physics,* v. 26, Apr. 1957, p. 802-804.

Diffusion coefficients for nickel in polycrystalline and monocrystalline nickel oxides have been measured by the surface-activity method from 1000 to 1400° C. in air. The results indicate that the oxidation of nickel under comparable conditions of temperature and pressure proceeds via lattice diffusion of nickel through nickel monoxide. (N1c, R1h; Ni)

204-N. A Note on the Effect of Antimony on Hole Formation During the Diffusion of Zinc From Brass in Vacuo. L. M. T. Hopkin. *Journal of the Institute of Metals,* v. 85, May 1957, p. 422-424.

Presence of antimony increases formation of holes associated with Kirkendall effect. Addition of 1-2% antimony to copper produced severe intergranular embrittlement in impact and tensile tests at elevated temperatures. 9 ref. (N1, Q26s; Cu-n, *Zn*)

205-N. Effect of Dissolved Oxygen on the Grain Size of Annealed Pure Copper and Cu-Al Alloys. D. L. Wood. *Journal of Metals,* v. 9, *AIME Transactions,* v. 209, Apr. 1957, p. 406-408.

Microscopic investigation indicated that grain growth restraint which occurs in advance of aluminum oxide front during internal oxidation of copper-aluminum alloys is result of oxygen in solid solutions. Oxygen in solid solution restrained grain growth in pure copper. (N3, R2s; Cu, Al)

206-N. Action of Vibration on Solidifying Aluminum Alloys. P. D. Southgate. *Journal of Metals,* v. 9, *AIME Transactions,* v. 209, Apr. 1957, p. 514-517.

Records size reduction of intermetallic crystals, decreased gravity segregation of these crystals, grain refinement and porosity reduction upon introducing metal probe vibrating at 8 kc. per sec. into small melts of solidifying aluminum alloys. Discusses cavitation hypothesis as explanation for effect of vibration. (N12; Al)

207-N. Habit Planes of Martensite in Chrome-Carbon Steel. H. M. Otte and T. A. Read. *Journal of Metals,* v. 9, *AIME Transactions,* v. 209, Apr. 1957, p. 412-417.

Observations on scatter of habit planes of martensite in a 2.8% chromium and 1.5% carbon steel; proposes possible reasons for existence of real scatter. 13 ref. (N8p; AY, *Cr*)

208-N. Grain Growth of Titanium Carbide in Nickel. Leonard P. Skolnick. *Journal of Metals,* v. 9, *AIME Transactions,* v. 209, Apr. 1957, p. 438-442.

Metallographic investigation of grain growth of titanium carbide compacts infiltrated with liquid nickel showed three successive growth stages. 17 ref. (N3; Ti, Ni, 6-19)

209-N. Structural Changes Associated With Strain-Induced Grain Boundary Migration in Silicon-Iron. K. T. Aust and C. G. Dunn. *Journal of Metals,* v. 9, *AIME Transactions,* v. 209, Apr. 1957, p. 472-478.

Applies chrome-acetic electro-etching method of locating dislocations to problem of strain-induced grain boundary migration in bi-crystals of silicon-iron (3¼% Si). Cold rolled 2 to 12% and annealed; observes dislocations, configurations and densities in adjacent grains before and after boundary movement and extent of crystal perfection in swept-out region. (N3, M26; Fe, *Si*)

210-N. On the Texture of Evaporated Films. R. B. Kehoe. *Philosophical Magazine,* v. 2, 8th Ser., Apr. 1957, p. 455-466.

Copper, silver and gold were evaporated onto heated cleavage surfaces of alkali halide crystals in an electron diffraction camera. The diffraction patterns were studied continuously as the depositions were

carried out and the crystalline arrangement in the films was deduced as a function of thickness. 20 ref. (N15g, M22h; Cu, Ag, Au)

211-N. - Kinetics of Nucleation in Supersaturated Vapors. Pt. I. R. Becker and W. Doring. *Henry Brutcher Translation* No. 3655, 13 p. (From *Annalen Der Physik,* v. 24, 1935, p. 719-731). Henry Brutcher, Altadena, Calif.

Review of published work; mathematical treatment of nucleation in supersaturated systems; thermodynamics of nucleation; concept of critical droplet size and its implications; liquid nuclei; consideration of a quasi-stationary condensation process; resistance as function of relative droplet radius; evolution of a formula which correctly reflects the entire available experimental data. (N2g)

212-N. Autoradiographic Study of Microsegregation in Steel. I. E. Bolotov. *Henry Brutcher Translation* No. 3866, 7 p. (From *Zavodskaya Laboratoriya,* v. 22, no. 6, 1956, p. 682-688). Henry Brutcher, Altadena, Calif.

Previously abstracted from original. See item 372-N, 1956. (N12, M23; ST)

213-N. (English.) **Study on Internal Adsorption of Carbon in Alpha-Iron by the Method of Internal Friction.** Yung Pao-Tsui and Ke T'ing-Sui. *Scientia Sinica,* v. 5, Dec. 1956, p. 645-656.

The change of the height of the carbon diffusion peak was observed during the process of decarburization of an alpha-iron specimen containing a small amount of carbon and it was found that the height of the peak first decreased and then increased with time to a maximum value. This indicates that the carbon adsorbed in iron goes into solid solution twice during the process of decarburization. 18 ref. (Ni, Q22, J4a; Fe, *C*)

214-N. (German.) **Kirkendall Effect in Silver-Gold Alloys.** Theodor Heumann and Guntram Walther. *Zeitschrift für Metallkunde,* v. 48, Apr. 1957, p. 151-157.

The migration of marked planes during the diffusion of binary solutions is considered; it is found that the direction of their migration is that of the plane of joining, only in certain places. In an investigation of silver-gold this change of direction has been found in the gold-rich and silver-rich ends of the diffusion curves. 11 ref. (N1e; Au, Ag)

215-N. (Japanese.) **Recrystallization Phenomena of Aluminum in Aluminum Chloride Baths.** Rinzo Midorikawa. *Electrochemical Society of Japan Journal,* v. 25, Jan. 1957, p. 13-16.

It is thought that the recrystallization process of aluminum is characterized by the formation of trivalent or monovalent aluminum in the salt bath at a temperature between 100 and 200° C.; discussion of aluminum recrystallization process and various experiments. 18 ref. (N5; Al)

216-N. (Japanese.) **Study on Refinement of Recrystallized Grain Size of 3S Alloy. Pt. 8. Effect of Iron and Silicon on the Precipitation Process of Aluminum-Manganese Alloy.** Kyoji Shimizu, Yoshizo Nakatani and Masaaki Yoshizaki. *Light Metals,* v. 7, Mar. 1957, p. 23-36.

Behavior of the precipitates formed during the preheating of aluminum-manganese, aluminum-manganese-iron, aluminum-manganese-silicon, and aluminum-manganese-iron-silicon alloys was investigated by measurements of the electrical resistance and microhardness, X-ray analysis and microscopical examination. (N8; Al, *Mn*)

217-N. (Japanese.) **Influence of Impurities on Some Properties of High-Purity Magnesium. Pt. 1. Effect of Zirconium on Cast Structure.** Riei Ichikawa. *Light Metals,* v. 7, Mar. 1957, p. 44-49.

Effect of zirconium on the grain refining of cast high-purity magnesium containing aluminum, silicon and manganese as impurities and the influences of aluminum, silicon and manganese as impurities on grain refinement of cast magnesium-zinc-zirconium alloys. (N3, 1-10; Mg, *Zr*)

218-N. Effect of Silicon on the Solubility of Nitrogen in Alpha and Gamma-Iron. R. Rawlings. *Iron and Steel Institute, Journal,* v. 185, Apr. 1957, p. 441-449.

Effect of silicon on nitrogen solubility in iron for temperature range 700-1000° C. determined by nitriding several iron-silicon alloys in partially dissociated ammonia. 12 ref. (N15d; Fe, *Si, N*)

219-N. Effect of Some Common Alloying Elements on the Breakdown of

Martensite in a W.Q. 0.35% Carbon Steel. A. S. Kenneford and T. Williams. *Iron and Steel Institute, Journal*, v. 185, Apr. 1957, p. 467-474.

Dilatometrical investigation on effect of silicon, manganese, nickel, chromium, molybdenum, vanadium and cobalt on the breakdown of martensite in steel containing about 0.35% carbon. Silicon delays softening during tempering by raising temperature at which martensite decomposes to ferrite and cementite. Other elements have little effect on temperature range of martensite decomposition. Chromium, vanadium, molybdenum delay softening during tempering by other mechanisms. (N8a, 2-10; AY)

220-N. Physical Metallurgy of Low-Carbon, Low-Alloy Steels Containing Boron. K. J. Irvine, F. B. Pickering, W. C. Heselwood and M. Atkins. *Iron and Steel Institute, Journal*, v. 186, May 1957, p. 54-67.

Transformation characteristics of low-carbon, low-alloy steels containing boron which were examined isothermally and on continuous cooling; effect on transformation diagram of small amount of molybdenum, tungsten and carbon in presence of boron; direct relation of mechanical properties to types of transformation products; suggests hypothesis for the mechanism by which boron promotes hardenability. 21 ref. (N8, J5, 2-10; AY, *B*)

221-N. High Temperature X-Ray Study on High Speed Steel. Pt. 1. Lattice Expansion of Matrix and Carbide. H. J. Goldschmidt. *Iron and Steel Institute, Journal*, v. 186, May 1957, p. 68-78.

X-ray study of the lattice expansion of ferrite, austenite and eta carbide phases in a normal 18-4-1 W-Cr-V type high-speed steel in the annealed condition for temperatures up to 1100° C. Resulting coefficients are interpreted in terms of "physical" and "chemical" expansion. 27 ref. (N8, M26; TS-m)

222-N. High-Temperature X-Ray Study on High Speed Steel. Pt. 2. Transformations During Tempering and Some Considerations on Martensite-Type Reactions. *Iron and Steel Institute, Journal*, v. 186, May 1957, p. 79-85.

Phase transformations during tempering of a quenched high speed 18-4-1 W-Cr-V steel were followed at 500, 550, and 600° C. by high-temperature X-ray and the progress of isothermal austenite to martensite to ferrite decomposition directly observed. Differences in the rate and manner are discussed and meaning of expansion coefficient of the temper phases is considered. 25 ref. (N8a, N8p; TS-m)

223-N. Correlation of Tensile Properties With Microstructure of Some 3% Nickel Steels. J. P. Hugo and J. H. Woodhead. *Iron and Steel Institute, Journal*, v. 186, June 1957, p. 174-188.

Relationships between isothermal transformation temperature and tensile properties of three 3% Ni steels were studied. In the pearlite range, confirmation was obtained for theory that interlamellar spacing of pearlite is inversely proportional to degree of undercooling. Thus, by relating all properties to degree of undercooling rather than to transformation temperature, effect of interlamellar spacing was determined. For pearlitic steels it was shown that after allowing for effects of proeutectoid ferrite, strength properties are linearly dependent on square root of the interlamellar spacing. Such a relationship is in accordance with dislocation theory. 29 ref. (N8, Q27a; AY, *Ni*)

224-N. Studies on Ball Bearing Steels. Pt. VIII. Behaviour of Carbides in Ball Bearing Steels by Electrolytic Isolation. Manabu Ueno and Hirooki Nakajima. *Journal of Mechanical Laboratory*, v. 11, May 1957, p. 108-113.

To investigate the nature of the cementite and matrix in ball bearing steels, cementite was isolated electrolytically; one SKF steel was compared with Japanese made steels by chemical analysis, electron-microscope and other methods. Analysis of results. 3 ref. (N8r, S11f; ST, SGA-c)

225-N. Some Estimates of the Thermal Stability of Dispersion-Hardened Alloys. A. W. Cochardt. *Journal of Metals*, v. 9, *AIME Transactions*, v. 209, Apr. 1957, p. 434-437.

Factors that govern thermal stability of dispersion hardened alloys; explains mechanism of over-aging. Makes estimates of time in which structural changes should occur in alloys hardened with aluminum oxide or other common hardeners. (N7; AD-q40)

226-N. Some Observations on Ferrite-Carbide Aggregates in Alloy

Steels. E. S. Davenport. *Journal of Metals,* v. 9, *AIME Transactions,* v. 209, May 1957, p. 677-688.

Briefly reviews literature on the isothermal transformation behavior of steels. Data on microstructure and mechanical properties of ferrite, carbide aggregates in nickel-chromium-molybdenum alloy steels of eutectoid carbon content. Aggregates formed from austenite by isothermal transformation grouped as lamellar intermediate acicular relating to the temperature in which they were formed. Mechanical properties of aggregate in intermediate range are inferior to those of fine pearlite and of bainite. 18 ref. (N8g; AY)

227-N. **Peritectoid Transformation in Ag-Al Alloys.** C. W. Spencer, R. J. Knight and F. N. Rhines. *Journal of Metals,* v. 9, *AIME Transactions,* v. 209, May 1957, p. 688-689.

Metallographic study of the peritectoid transformation as it occurs in two silver-aluminum alloys containing 6.0 and 6.9% aluminum respectively. 4 ref. (N11g; Ag, Al)

228-N. **Hydrogen Control Cuts Titanium Rejections.** *Light Metal Age,* v. 15, June 1957, p. 17-18. (CMA)

Chance-Vought has reduced the hydrogen content of its titanium alloys so far that rejections have been cut from 17 to 0.5% in two years. The F8U-1 Crusader use 650 lb. of titanium in its tail cone and aft fuselage. A maximum of 150 ppm. has been established for hydrogen in titanium alloy sheet. Vacuum hot extraction gas analysis equipment is used to determine the amount of hydrogen. (N15d, T24, 17-7; Ti, *H*)

229-N. (French.) **Investigation by Means of Electronic Microdiffraction and Microscopy of the Transformation of the Alloys of Al-Cu by Heat in a Vacuum.** N. Takahashi and K. Mihama. *Acta Metallurgica,* v. 5, Mar. 1957, p. 159-168.

Metallurgical transformation was observed in single crystal state, obtained by heating specimen to about 500° C. and when using 4% Cu alloy to observe a Cu-Al monocrystal. 11 ref. (N6, M22h, 1-23; Al, Cu)

230-N. (French.) **Solubility of Oxygen in High-Purity Iron.** Raymond Sifferlen. *Comptes Rendus,* v. 244, Feb. 25, 1957, p. 1192-1193.

New experiments confirm that solubility of oxygen tends to become nil in case of a very pure, perfectly recrystallized iron. 2 ref. (N15e; Fe, *N*)

231-N. (French.) **Influence of Purity and Structural State of Iron on Its Absorption Capacity for Cathodic Hydrogen.** Simone Besnard and Jean Talbot. *Comptes Rendus,* v. 244, Feb. 25, 1957, p. 1193-1195.

Further tests on hydrogen absorption using high-purity iron obtained by the zone melting process. 4 ref. (N15e; Fe, *H*)

232-N. (French.) **Influence of Stresses on the Allotropic Transformation of Cobalt.** Hervé Bibring and Francois Sebilleau. *Comptes Rendus,* v. 244, Mar. 11, 1957, p. 1496-1499.

Description of tests performed on 99.5% pure samples of polycrystalline cobalt containing 0.1% Ni, 0.1% Fe and 0.02% Cu; results. 4 ref. (N6p, 3-16; Co)

233-N. (French.) **Influnce of Adsorbed Gases on Surface Recrystallization of Zinc.** Mireille Fritz. *Comptes Rendus,* v. 244, Mar. 25, 1957, p. 1769-1771.

Such influence varies inversely to annealing temperature. (N5, J23; Zn)

234-N. (French.) **Orientation of the Alpha Cold Working Phase Following Plastic Deformation of an Unstable Austenitic Steel.** Paul Bastien and René Margerand. *Comptes Rendus,* v. 244, Mar. 25, 1957, p. 1774-1777.

Alpha phase appears only if the austenite has previously been oriented by means of a sufficient plastic deformation (10 to 20% compression). (N8, 3-18; ST)

235-N. (French.) **Study of the Tungsten-Silicon Melting Diagram.** René Blanchard and Jean Cueilleron. *Comptes Rendus,* v. 244, Mar. 25, 1957, p. 1782-1785.

Diagram established by determination of melting points, chemical analysis, metallographic and X-ray examination of a very large number of tungsten-silicon alloys. 7 ref. (N12, P12n; W, Si)

236-N. (French.) **Orientation of Cobalt Precipitations in a CuCo Alloy.** Louis Weil, Lucie Gruner and André Deschamps. *Comptes Rendus,* v. 244, Apr. 15, 1957, p. 2143-2146.

Magnetic measurements taken at very low temperatures to avoid fluctuation showed that cobalt segregations in an elongated alloy are oriented. This orientation may be due to an epitaxy of the cobalt in the copper or to the elongated shape of the precipitates. (N7; Cu, Co)

237-N. (French.) **Surface Reactions on Stainless Steels.** T. N. Rhodin. *Journal de Chimie Physique,* v. 54, Jan. 1957, p. 72-89.

Three gas-metal reactions studied: adsorption, oxidation and decarburization. 38 ref.
(N15d, P13d, R1h, J4a; SS)

238-N. (Japanese.) **Working and Recrystallization of Commercially Pure Titanium.** T. Morinaga, T. Takahashi and T. Taki. *Light Metals (Tokyo),* no. 23, Mar. 1957, p. 63-70. (CMA)

Commercial titanium wire was studied by X-ray methods and microscopy, and changes in specific resistivity were observed microscopically by changes in the titanium grain size. Twinned and untwinned grains show similar hardness but the latter may be slightly harder. Many newly recrystallized grains nucleate from the deformed coarse grains when they are heated up through the transformation range. Electrical resistivity is almost recovered below 400° C. Minimum values occur in the 500-550° C. range. Annealing at high temperature does not cause the recrystallized grains to grow much.
(N5f, P15g; Ti-a)

239-N. (Russian.) **Determination of Heat of Phase Transformation of Cerium Under Pressure.** M. G. Gonigberg, G. P. Shakhovskoi and V. P. Butuzov. *Zhurnal Fizicheskoi Khimii,* v. 31, Feb. 1957, p. 350-353. (CMA)

It is known that under elevated pressure metallic cerium transforms into a new modification of the same crystallographic structure but having smaller lattice parameters. However, due to the fact that the compressibility gradually decreases before the actual transformation, no precise measurements could be made either of the pressure or the volume change of the transformation, values that are necessary for the calculation of the latent heat of the process. The latter heat effect was directly determined by applying to high pressures the method of thermograms in which comparison is made of heat effect of phase transformations in the examined substance and a known standard. The heat of transformation of cerium was found to be 880 $\pm$ 40 cal. per g.-atom at 13-18° C. and about 7000 kg. per sq. cm. pressure. This result confirms the hypothesis of the structural identity of the new phase and the low-temperature modifications of cerium. 13 ref. (N6, P12q, 3-24; Ce)

240-N. **Graphitization of Cast Iron. Studies on the Expansion of Cast Iron During Heating. Report 1.** Isamu Igarashi and Yo Serita. *Casting Institute of Japan, Journal,* v. 29, Mar. 1957, p. 141-145.

Graphitization of cast iron studied by means of microscope and differential dilatometer. Specimens were prepared from chill castings of 3.6% carbon alloys to which silicon, phosphorus and chromium were added respectively. The thermal expansion test was carried out in a vacuum (10^{-3} mm. Hg) keeping the heating temperature at 900° C. At 900° C. the contraction in the first period caused by the precipitation of carbide into austenite domain was observed. Discusses graphite precipitation and austenite growth.
(N8s, P11g, CI-q)

241-N. **Study on High Silicon-Aluminum Alloys. Report 1. Mechanism of Refining of Primary Silicon Crystal.** Shiro Terai. *Casting Institute of Japan, Journal,* v. 29, Mar. 1957, p. 157-163.

The mechanism of refining of primary silicon crystal in silicon-aluminum alloys by the addition of small amounts of phosphorus was studied. Such addition to aluminum alloys with high silicon content caused the formation of nuclei of primary silicon crystal. 8 ref. (N2; Si)

242-N. **Reaction of Zirconium With Water Vapor at Subatmospheric Pressures.** M. W. Mallett, W. M. Albrecht and R. E. Bennett. *Electrochemical Society, Journal,* v. 104, June 1957, p. 349-352. (CMA)

Zirconium was reacted with water vapor at 33 mm. Hg in the range 300-600° C. The rates follow a cubic law, and the rate constant is given as a function of the activation energy (29,700 cal. per mole). Monoclinic oxide films are N-type semiconductors. The formation mechanism is the same as in the zirconium-oxygen reaction. (N15f, R4d; Zr)

243-N. **Thermal Stabilization of Austenite in a 10% Ni, 1% C Steel.** B. Edmondson. *Acta Metallurgica,* v. 5, Apr. 1957, p. 208-215.

Current knowledge of stabilization of austenite is assessed and stabilization in a 10%, 1% C steel is examined. An explanation of the results obtained in terms of the diffusion of interstitial solute atoms to preferred sites within the metal is proposed. (N8f; SS, *Ni*)

244-N. Graphical Analysis of Diffusionless Phase Changes—the Cubic to Twinned Orthorhombic Transformation. D. S. Lieberman, T. A. Read and M. S. Wechsler. *Journal of Applied Physics,* v. 28, May 1957, p. 532-541.

A simplified method of calculating the crystallographic features of a diffusionless (martensitic) phase change is described and applied to the gold-cadmium alloy cubic orthorhombic transformation.
(N6q; Au, Cd)

245-N. (Japanese.) **Study on Special Wrought Magnesium Alloys. Pt. 2. Effect of Zirconium Additions on Some Properties of Magnesium and Its Alloys.** Shiro Terai. *Light Metals,* v. 7, Mar. 1957, p. 54-62.

Zirconium refines the cast structure of magnesium, raises the recrystallization temperature of magnesium about 100° C., decreases the directionality of magnesium sheet as rolled. (N5, M27, 1-10; Mg, *Zr*)

246-N. (Russian.) **Concerning Methods of Research on the Kinetics of Graphitization of Cast Iron.** Y. V. Grechnii and N. M. Danilchenko. *Liteinoe Proizvodsvo,* no. 3, Mar. 1957, p. 20-22.

The industrial importance of graphitization of ferrous alloys, its supposed mechanism; the speed of the initial formation of graphite; the rapidity of solidification and the time required to raise it to annealing temperature; the influence of preliminary low temperature on the development of graphitizing centers and corresponding kinetic processes.
(N8s; CI)

247-N. (Swedish.) **Research on Carbides in Alloy Steels.** Kehsin Kuo. *Jernkontorets Annaler,* v. 141, no. 4, 1957, p. 206-230.

Tempering of carbon steels; partition of alloy elements between cementite and ferrite; precipitation of alloy carbides and secondary hardening; alloy carbides in tungsten and tungsten chromium steels; results obtained by hardness measurements, electron microscopic examination, chemical analysis and X-ray phase analysis. 39 ref. (N8r; AY)

248-N. Influence of the Carbon-Silicon Ratio on Graphitization of Malleable Iron. Areil Taub and Ehud Avivi. *Foundry,* v. 85, July 1957, p. 101-103.

Experimental study of relationship between carbon-silicon ratio and time for decomposition of cementite into graphite and ferrite in chilled white iron bars. Effects of manganese and sulphur.
(N8s, 2-10; CI-p, CI-s)

249-N. Diffusion of Calcium and Silicon in a Lime-Alumina-Silica Slag. Helen Towers and John Chipman. *Journal of Metals,* v. 9, *AIME Transactions,* v. 209, June 1957, p. 769-773.

Investigates a capillary method and a rotating block method for the study of diffusion of calcium and silicon in slag. Capillary method using radioactive calcium-45 and silicon-31 is used for calculating diffusion coefficient values in a slag of 39% calicum oxide, 21% alumina, 40% silicon dioxide. 4 ref.
(N1a; Ca, Si, RM-q)

250-N. Preparation and Properties of Boron Treated Nonaging Open Hearth Steel. Eric R. Morgan and John C. Shyne. *Journal of Metals,* v. 9, *AIME Transactions,* v. 209, June 1957, p. 781-785.

Principles of strain aging and its elimination by boron additions. Interrelation following boron addition of bearing, rimming and capping techniques with boron content in ingots. 7 ref. (N7e; ST-e, *B*)

251-N. Effect of Alloying Elements on the Rate of Graphitization of White Cast Iron. M. A. Krishtal. *Metal Progress,* v. 72, July 1957, p. 136-137. (Digest from *Metallovedenie i Obrabotka Metallov,* no. 5, 1956, p. 17-18.)

Data on the effect of tungsten on graphitization of a 4% C, 1.2% Si cast iron show that under most conditions the rate of graphitization, v, is limited by diffusion in the iron matrix rather than by the diffusion of carbon atoms. (N8s, N1; CI-p)

252-N. Diffusion of Arsenic in Steel. D. S. Kazarnovskii. *Metal Progress,* v. 72, July 1957, p. 144. (Digest from *Doklady Akademii Nauk, S.S.S.R.,* v. 100, no. 6, 1955, p. 1073-1075.)

Previously abstracted from original. See item 207-N, 1955.
(N1, M27; ST, *As*)

253-N. Pearlitic Reaction in Alloy Steel. R. I. Entin. *Metal Progress,* v. 72, July 1957, p. 173-175. (Digest from *Metallovedenei i Obrabotka Metallov,* no. 9, 1956, p. 3-9; no. 10, 1956, p.20-28.)

Previously abstracted from original. See item 538-N, 1956.
(N8h, AY)

254-N. Characteristics of the Bond Interface Formed Between Zircaloy-2 and Uranium-12 w/o Molybdenum. H. A. Saller, S. J. Paprocki and E. S. Hodge. *U. S. Atomic Energy Commission, BMI-1048*. Oct. 17, 1955. 46 p. (CMA)

The bond interface formed by cladding was studied for high-temperature corrosion resistance. Various degrees of interdiffusion were obtained under the pressure bonding conditions. Corrosion resistance was greatest where interdiffusion was least. Extensively interdiffused samples failing by rupture in 630° F. water. The least resistant alloys were those with 12% Mo and zirconium replacing the uranium. Chromium, platinum and tantalum layers show the best resistance.
(N1h, L22, R general, 2-12; Zr, U)

255-N. The Transformation Kinetics of Uranium-Zirconium Alloys Containing 50 and 60 Wt Pct. Uranium. J. J. Kearns *U. S. Atomic Energy Commission,* WAPD-T-417, Nov. 21, 1956, 36 p. (CMA)

The isothermal transformation kinetics of the γ-phase of 50% Zr and 40% Zr uranium alloys were studied in the 200-580° C. range. Dilatometric, metallographic, X-ray diffraction and hardness data were obtained for quenching from γ-solution to the isothermal transformation temperature and to 25° C., followed by reheating. The ordered E-phase forms and grows above 500° C. very rapidly. The reaction starts rapidly at lower temperatures and the process resembles that at high temperatures, but the rate falls off. X-ray diffraction shows diffuse superlattice lines although the main lattice lines are sharp throughout transformation. When samples are quenched below the nose of the transformation curve, rippled microstructures are shown and a hardening reaction sets in. Dispersed E grains are believed to coalesce into subcells. Some alpha uranium precipitates in transformation.
(N7c, N10; U, Zr)

256-N. Magnesium-Zirconium Diffusion Studies. L. S. DeLuca, H. T. Sumsion and D. D. Van Horn. *U. S. Atomic Energy Commission,* KAPL-1746, Apr. 1, 1957, 31 p. (CMA)

The interdiffusion between magnesium and zirconium in the 500-540° C. range was studied metallographically. The layer formed is made up of as many as three separate zones. The first is formed by the grain-boundary diffusion of magnesium into zirconium, and was observed at all temperatures. The activation energy for the process is 18,300 cal. per gram-atom for zone 1 alone and 34,200 cal. per gram-atom with either zone 2 or 3. Vapor transport is important in zone 1 formation. Zones 2 and 3 are formed by zirconium diffusion into magnesium in different solute concentrations, and the formation rate is insignificant below 600° C. 8 ref.
(N1e; Mg, Zr)

257-N. (French.) **Study of Isothermal Transformations of Iron With Cu-Cr and Ni-Cr Containing Approximately 0.5% Mo.** Albert de Sy and J. Van Eeghem. *Fonderie Belge,* no. 5, May 1957, p. 92-105.

Presents TTT-diagrams for seven types of cast iron and discusses influence of molybdenum, copper, nickel and chromium on the transformation curves. The structures in the raw state of casting are compared with the TTT-diagrams, and it is shown that there is an excellent correlation. Micrographs illustrate various structures obtained.
(N8g, 2-10; CI-q, *Mo*)

258-N. (French.) **Action of Some Pure Gases and Their Mixtures on the Surface (0001) of Pure Zinc.** L. Cavallaro and G. P. Bolognesi. *Journal de Chimie et de Physico-Chimie Biologigue,* v. 54, Jan. 1957, p. 63-71.

Study of action of O_2, SO_2, N_2, CO_2, SO_2-N_2 and O_2-SO_2 on freshly split surface of pure zinc. 40 ref.
(N15d; Zn)

259-N. (German.) **Precipitation Hardening Process From the Thermodynamic Point of View.** Ulrich Dehlinger and Hermann Franz. *Zeitschrift Für Metallkunde,* v. 48, Apr. 1957, p. 176-180.

Precipitation occurs below the spinodal in a single process by negative diffusion followed by a rearrangement of the segregated domains. The phases of theta-prime and theta nucleate dislocations by reactions of the first order. Such a nucleation has to be assumed, in the formation of regular eutectoid structure, like pearlite. 21 ref.
(N7b, N2g)

260-N. (Japanese.) **Study on Carbides in Structural Steels by Electrolytic**

Isolation. Pt. 3. Tomo-o Sato, Taiji Nishizawa and Masaaki Ohashi. *Iron and Steel Institute of Japan, Journal,* v. 43, Apr. 1957, p. 485-489.

Electrolytic isolation studies were carried out on carbides in Ni-Cr, Cr-Mo and Si-Mn structural steels. Concentrations of special elements in carbides in these steels, tempered at about 400° C., are similar to the contents of each element in the steels. At above 500° C., the carbides are enriched in Cr, Mn and Mo, while impoverished in Si and Ni. The rate of enrichment of Mo in carbides is exceedingly slow, as compared with that of Cr and Mn. The rate of enrichment of Cr and Mn in carbides is retarded by the coexistence of Mo in the steel. 5 ref. (N8r, 2-10, M23; AY, *Ni, Cr, Mo, Mn*)

261-N. (Russian.) **Growth of Grains of Commercial Titanium During Heating.** L. N. Sokolov. *Metallovedenie i Obrabotka Metallov,* no. 10, Oct. 1956, p. 34-36. (CMA)

The size of titanium grains in previously deformed samples was measured as a function of temperature and time of heating. In the interval 800-1100° C. the size increases with the temperature, and for a given temperature the grains grow with time until the point is reached when this growth is arrested as a result of the precipitation of impurities. In commercial titanium containing 0.5% C the grain remains comparatively small up to 1100° C.; this may be due, among other causes, to the presence of a carbide phase. 3 ref. (N3, 2-11; Ti)

262-N. Effects of Plastic Deformation on Carbide Precipitation in Steel. D. V. Wilson. *Acta Metallurgica,* v. 5, June 1957, p. 293-302.

Carbon steels containing 0.47, 0.74 and 0.88% carbon were studied. Cold work restrains precipitation in quenched steels. If a steel is first tempered to precipitate an iron carbide and then deformed, the precipitate will tend to redissolve in the cold worked matrix. 20 ref. (N7b, 3-18; CN)

263-N. Precipitation in Gold-Platinum Alloys. T. J. Tiedema, J. Bouman and W. G. Burgers. *Acta Metallurgica,* v. 5, June 1957, p. 310-321.

Experiments and theories on precipitation stage characterized by "side bands". Determination of two phase boundary by means of Debye-Scherrer photographs. 22 ref. (N7b; Au, Pt)

264-N. Strain Aging of Boron-Treated Low-Carbon Steels. E. R. Morgan and J. C. Shyne. *Iron and Steel,* v. 30, June 1957, p. 269-271.

Two series of alloys were tested. Aging index was markedly reduced by addition of boron. Maximum effect occurred in range 0.007-0.025% boron. Also showed carbide increase without producing a precipitate of iron boride and had no effect on grain size. (N7e; CN, *B*)

265-N. Physical Metallurgy of Low-Carbon, Low-Alloy Boron Steels. K. J. Irvine, F. B. Pickering, W. C. Heselwood and M. Atkins. *Iron and Steel,* v. 30, June 1957, p. 272-280.

Transformation characteristics were examined isothermally and on continuous cooling. Effects of molybdenum, tungsten, manganese and carbon on transformation also required. (N8g, 2-10; AY, *B*)

266-N. Calculation of Diffusion Coefficients by the Matano-Boltzmann Method. E. M. Baroody. *Journal of Metals,* v. 9; *AIME Transactions,* v. 209, July 1957, Sec. 2, p. 819-822.

New way of applying method is derived and illustrated. Curve obtained, when concentration is plotted against position on probability paper, is approximated by a polynomial, and diffusion coefficient calculated from an equation in which the coefficients of the polynomial appear as parameters. 8 ref. (N1b)

267-N. Some Aspects of Alloying Onto Germanium Surfaces. J. W. Peterson, J. McGlasson, Jr., and W. C. Hittinger. *Journal of Metals,* v. 9; *AIME Transactions,* v. 209, Sec. 2, July 1957, p. 823-827.

Layers of n-type with thickness in range of 0.0002 in. over areas of 0.006 sq. in. were produced on intrinsic germanium wafers by an alloy regrowth process as one stage in the fabrication of transistors. In process now in use, lead is the solvent and antimony the doping impurity. 8 ref. (N12, T1k, 17-7; Ge, *Sb*, 9-1)

268-N. Cube Texture in Copper. Y. C. Liu. *Journal of Metals,* v. 9; *AIME Transactions,* v. 209, July 1957, Sec. 2, p. 836-842.

Copper single crystals of $(3\bar{5}8)$ $[\bar{5}23]$ initial orientation retain their orientation up to 95% reduction in thickness. In deformed matrix of

same orientation, occurrence of recrystallization texture depends on both annealing temperature and rolling reduction. 14 ref. (N5; Cu, 14-11)

269-N. Grain Growth in Dilute Alloys of Copper. S. Weinig and E. S. Machlin. *Journal of Metals,* v. 9; *AIME Transactions,* v. 209, July 1957, Sec. 2, p. 843-845.

Grain growth law $D^{1} = kt^{n}$ was found to describe data for dilute binary alloys of copper satisfactorily. Activation energies for grain migration compare well with values obtained from internal friction studies on identical alloys. 7 ref. (N1m; Cu)

270-N. Concerning an Order-Disorder Transition in the Ni-Cr System. B. W. Roberts and R. A. Swalin. *Journal of Metals,* v. 9; *AIME Transactions,* v. 209, July 1957, Sec. 2, p. 845-846.

Results of neutron diffraction investigation coupled with a dilatometric investigation. 8 ref. (N10, M24b; Ni, Cr)

271-N. Preferred Growth Direction of Metals. William A. Tiller. *Journal of Metals,* v. 9; *AIME Transactions,* v. 209, July 1957, Sec. 2, p. 847-855.

For face-centered cubic metals, preferred orientation formed during solidification of columnar zone of an ingot is: (1) the [111] direction for pure metals, (2) no preferred direction for slightly impure metals, (3) the [100] direction for impure metals and alloys. Direction of formation of boundaries between substructures and occurrence of stray crystal formation a function of orientation of solid-liquid interface and degree of constitutional supercooling. 15 ref. (N5g, N12)

272-N. Nucleation Sites of Bainitic Carbides in Alloy Steels. S. M. Kaufman, G. M. Pound and H. I. Aaronson. *Journal of Metals,* v. 9; *AIME Transactions,* v. 209, July 1957, Sec. 2, p. 855-856.

Effects of alloying elements on the nucleation sites selected by bainitic carbides. It is concluded that the carbides can nucleate both in austenite and in ferrite. 9 ref. (N2, N8r, 2-10; AY)

273-N. Aging in Complex Commercial Ni-Cr Alloys Hardened With Titanium and Aluminum. R. F. Wilde and N. J. Grant. *Journal of Metals,* v. 9; *AIME Transactions,* v. 209, July 1957, p. 865-872. (CMA)

Air-melted Inconel X 550, Inco 700, and vacuum-melted M-252 and Waspaloy (all hardened with titanium and aluminum) were studied in detail for the aging response. The γ' phase Ni_3 (Al, Ti) was identified in all but M-252; the latter has a matrix parameter larger than that of γ' because of the high molybdenum content. Carbide is shown to precipitate in M-252. Air cooling of thin sections fails to maintain all the aluminum and titanium in solution except possibly in Inconel X 550 cooled from 1900° F. (but not from 2200° F.). (N7a; Ni, Cr, SGA-h, *Ti, Al*)

274-N. Diffusion in Gold and Au-Ag Alloys. H. W. Mead and C. E. Birchenall. *Journal of Metals,* v. 9; *AIME Transactions,* v. 209, July 1957, Sec. 2, p. 874-877.

Self-diffusion coefficients of gold in pure gold and alloys of gold and silver measured over a range of temperatures. Results compared with earlier work and internally on basis of Darken's equations. 18 ref. (N1d; Au, *Ag*)

275-N. Preparation of Alpha Uranium Single Crystals by a Grain-Coarsening Method. E. S. Fisher. *Journal of Metals,* v. 9; *AIME Transactions,* v. 209, July 1957, Sec. 2, p. 882-888.

Factors influencing grain growth, size of coarse grains in uranium and preparation of single crystals of round cross section are discussed. 6 ref. (N3r; U)

276-N. Hydrogen Distribution in Heat Treated Titanium as Established by Autoradiography. O. J. Huber, et al. *Journal of Metals,* v. 9; *AIME Transactions,* v. 209, July 1957, p. 918-923. (CMA)

A dark-etching phase is often introduced at the grain boundaries of beta-titanium alloys on duplex heat treatment. This has been observed in Ti-5Mn-2.5Cr, Ti-3.5Cr-3.5V, Ti-8Mn and Ti-3Mn complex. The latter was studied by autoradiography, using tritium as a tracer, and by electron microscopy. The phase is shown to be hydrogen-rich and appears where the ratio of alpha to beta is relatively high. The duplex heat treatment involved isothermal annealing in the 800-1100° F. range. (N15d, M23q; Ti)

277-N. Blister Formation in Rolled Aluminum. J. H. O'Dette. *Journal of Metals,* v. 9; *AIME Tranactions,* v. 209, July 1957, Sec. 2, p. 924-929.

Study of the more commonly used methods of removing hydrogen from aluminum, location of discontinuities, study of movement of gas in the metal and effect on blistering, development of methods of blister control during fabrication. 6 ref. (N15e, F23; Al, 9-21)

278-N. Diffusion of Magnesium, Silicon, and Molybdenum in Nickel. R. A. Swalin, Allan Martin and R. Olson. *Journal of Metals,* v. 9; *AIME Transactions,* v. 209, July 1957, Sec. 2, p. 936-939.

Diffusion rates were measured as a function of temperature. Activation energies obtained were close to that for self-diffusion in nickel with the exception of magnesium. 7 ref. (N1e; Ni, *Mg, Si, Mo*)

279-N. Diffusion Characteristics of Thorium and Aluminum. J. A. Milko. Oak Ridge National Laboratory. *U. S. Atomic Energy Commission,* ORNL-1774, Dec. 30, 1954, 35 p.

Investigation to develop information on the construction of assemblies for a converter type of reactor utilizing aluminum-clad thorium plates. Extent of the diffusion was evaluated by a measurement of the thickness of the resulting diffusion layer formed between these two metals, in intimate contact, in vacuum. An appreciable amount of diffusion was observed between thorium and aluminum, particularly in the temperature range of 500 to 600° C. Barriers of aluminum-silicon alloys were not effective in minimizing the diffusion. (N1h; Th, Al)

280-N. Investigation of Uranium Solid Solubility in Thorium. Arthur A. Bauer, Frank A. Rough and Ronald F. Dickerson. Battelle Memorial Institute. *U. S. Atomic Energy Commission,* BMI-1188, May 29, 1957, 10 p.

Metallographic, hardness, X-ray diffraction and electrical-resistivity data. On the basis of electrical resistivity and X-ray diffraction data, solubility of uranium in thorium lies between 1.5 and 2% uranium at 1000° C. and between 0.5 and 1% uranium at 800 and 900° C. At temperatures below 800° C., solubility is less than 1% uranium. (N12p; U, Th)

281-N. Diffusion of Oxygen in Zirconium and Its Relation to Oxidation and Corrosion. J. P. Pemsler. *U. S. Atomic Energy Commission,* NMI-1177, May 31, 1957, 49 p. (CMA)

Oxygen diffusion into zirconium and dilute zirconium alloys was studied in the 400-585° C. range by observing the dissolution rates of anodically deposited interference oxide films. The diffusion coeficient is at a minimum when the c-axis parallels the plane of diffusion, and at a maximum when they are at a 20° angle; at higher angles the values are intermediate. (N1b, R1h; Zr, *O*)

282-N. Germinative Grain Growth Characteristics of Zirconium. J. C. Bohros. *U. S. Atomic Energy Commission,* NAA-SR-1926, June 15, 1957, 26 p. (CMA)

Above 950° F., zirconium, which has been strained beyond a critical point, will show germinative grain growth during recrystallization. This can reduce fatigue life by a factor of 2 to 9 at both high and low temperatures. A study of recrystallized grain size vs. plastic strain and annealing temperature showed that germinative grain growth may be avoided by a temperature limitation on inhomogeneously deformed zirconium and Zircaloy-3. Zircaloy-2 shows no germinative grain growth up to 1200° F. (N3, N5; Zr)

283-N. Self-Diffusion and Interdiffusion in Gold-Nickel Alloys. J. E. Reynolds, B. L. Averbach and M. Cohen. Massachusetts Institute of Technology (Wright Air Development Center.) *U. S. Office of Technical Services,* PB 121457, Mar. 1956, 36 p. $1.

Measurements were taken on the self-diffusion and interdiffusion coefficients in gold-nickel alloys as a function of composition and temperature. The data were combined with the thermodynamic properties of the gold-nickel system to test the validity of the Darken equation for the quantitative relationships between the intrinsic and interdiffusion coefficients. The relationship was found to hold within the experimental accuracy of the measurements. (N1d, N1e; Au, Ni)

284-N. Anisotropy of the Rate of Crystal Growth. F. P. Rybalko. *Fizika Metallov i Metallovedenie,* v. 3, 1956, p. 184-185. *(Henry Brutcher Translation* no. 3942).

Phenomena contradicting the "law" of crystallization according to which the ratio among the rates of growth of individual crystal faces remains constant regardless of changes in the conditions of crystallization. (N12)

285-N. Problem of Graphitization of Low-Carbon Steel. I. V. Salli and I. I. Pyasetskii. *Fizika Metallov i Metallovedenie,* v. 13, 1956, p. 513-515. (*Henry Brutcher Translation* no. 3952).

Mechanism of graphization with special reference to processes occurring during heat treatment in vacuum. Effect of cooling rate upon precipitation of graphite on specimen surface. Interpretation of results with the aid of the ferrite-graphite equilibrium curve in the iron-carbon phase diagram; causes of graphitization of low-carbon steel. (N8s; CN)

286-N. Kinetics of Change in Microstructure of Metals and Alloys During Creep, Involving High-Temperature Heating Under Tension and Vacuum. M. G. Lozinskii and E. I. Antipova. *Metallovedenie i Obrabotka Metallov,* v. 1, 1955, p. 9-14. (*Henry Brutcher Translation* no. 3965).

Previously abstracted from original. See item 118-N, 1956. (N8, N5, Q3, AY, Cu, Ni)

287-N. Grain Growth of Technical Titanium on Heating. L. N. Sokolov. *Metallovedenie i Obrabotka Metallov.* v. 2, 1956, p. 34-36. (*Henry Brutcher Translation* no. 3856).

Effect of duration and temperature of heating in range of from 700 to 1100° C. of previously deformed technical titanium (containing 0.5% carbon) upon its grain growth. Typical microstructures obtained after various heat treatments; limited effect of duration of heating; reason for the fine grain in 0.5% C. technical titanium on heating to 1100° C. (N3, 2-14; Ti)

288-N. Sigma Phase in 25-20 Steel Welds. B. I. Medovar. *Metallovedenie i Obrabotka Metallov,* no. 3, Mar. 1957, p. 27-30. (*Henry Brutcher Translation* no. 3954).

Investigation of conditions under which sigma phase is formed in a 0.12% C., 1.1% Mn, 23% Cr, 18½% Ni steel (automatic welding, ½-in. gage). Procedure based on impact tests, micrographic analysis, and X-ray study of isolated precipitates. Effect of strain hardening on sigma formation. Danger of gamma-to-sigma transformation. Steps recommended for suppression to sigma in weldments of 25-20 steel. (N8, K9r; SS)

289-N. (German.) **Calorimetric Investigations Into Kinetics of the Isothermal Decomposition of Austenite in Steels Containing 12% Manganese.** Gaston Collette. *Archiv für das Eisenhüttenwesen,* v. 28, Apr. 1957, p. 229-235.

Experiments with cast and cold rolled hard manganese steel at temperatures of 200 to 500° C.; interpretation of heat generation; kinetics of platelike carbide separation within the grain; relationship between time of the greatest heat generation and the experimental temperature; calculation of the time at which the first platelike separations can be seen with a microscope. (N8; AY, *Mn*)

290-N. (Polish.) **An Attempt at Mathematical Interpretation of Relationship Between Limited Solubility and Temperature.** Z. Jasiewica and J. Janus. *Hutnik,* v. 24, Apr. 1957, p. 138-142.

Computation of limiting solubility curve from free energy change; graphic solutions for alloys of Cu-Ag and Al, Mg-Al and Zn; Fe-P, Ti, Sn, Mo, W; and Pb-Sn; comparison of experimental results with computation. (N12p, P12a)

291-N. Aging Characteristics of Ternary Aluminium-Zinc-Magnesium Alloys. I. J. Polmear. *Department of Supply, Research & Development Branch, Aeronautical Research Laboratories,* ARL/MET 20, Jan. 1957, 39 p.

Hardness-aging time curves for temperatures between −20 and 240° C. of alloys containing 4, 6 and 8% zinc and 0 to 3% magnesium. Results showed two stages in aging processes which were concluded to be Guinier-Preston zones and an intermediate precipitate. However, equilibrium phase or phases may not have been detected and there may be three phases involved. 36 ref. (N7a; Al, *Zn, Mg*)

292-N. Solid-Solution Hardening of Aluminum and Magnesium. D. Hardie and R. N. Parkins. *Institute of Metals, Journal,* v. 85, June 1957, p. 449-455.

Hardness test and lattice parameter measurement conducted on aluminum and magnesium solid solutions. Materials alloyed with aluminum included copper, germanium, magnesium, silver, zinc or silicon; solutes dissolved in magnesium were aluminum, bismuth, cadmium, indium, lead, lithium, silver, tin or zinc; established relationship between lattice distortion and hardening and between extent of hardening and solute concentration.
(N12p, N7, Q29; Al, Mg)

293-N. Mechanical Properties Versus Microstructure. J. B. Malerich and G. V. Cash. *Metal Progress,* v. 72, Aug. 1957, p. 106-111.

Tempered martensite is the best microstructure for low-alloy Cr-Mo-V steel if impact strength and ductility (in tensile and stress-rupture tests) are desired; fine bainite is best if short-time tensile and stress-rupture strength is desired; coarse bainite has best creep strength at 900 and 1000° F. (N8m, N8p, Q27a, Q3m, Q6n; AY, *Cr, Mo, V*)

294-N. Transformation of Austenite to Bainite. L. M. Pevsner, T. D. Kubyshkina, G. M. Rovenskii and A. I. Samoilov. *Metal Progress,* v. 72, August 1957, p. 150-151. (Digest from *Metallovedenie i Obrabotka Metallov,* no. 10, 1956, p. 2-20.)

Previously abstracted from original. See item 30-N, 1957. (N8m; ST)

295-N. Application of Radioactive Tracers to the Study of Transgranular and Grain-Boundary Diffusion. C. Leymonie and P. Lacombe. *Metaux,* no. 358, 1955, p. 231-242. (*Henry Brutcher Translation* no. 3782.)

Previously abstracted from original. See item 330-N, 1956. (N1, S19)

296-N. Theory and Calculation of Induction of Elastic Oscillations in Molten Metal. I. I. Teumin. Problems of Metallography and Metal Physics, 4th Collection of Papers, 1955, Moscow, p. 50-69. (*Henry Brutcher Translation* no. 3930.)

Effect of mechanical oscillation on the crystallization of metals and the potentialities of their practical application, with special reference to the induction of elastic waves in the ultrasonic range directly in liquid metal. Methods of inducing elastic oscillations in metal melts; traveling-wave conditions; standing-wave conditions.
(N12, 1-24, Q21f; 14-10)

297-N. Kinetics of Growth of the Diffusional Layer in the Boronizing of Steel. V. D. Taran and L. P. Skugorova. *Fizika Metallov i Metallovedenie,* v. 3, No. 1, 1956, p. 66-69. (*Henry Brutcher Translation no.* 3976.)

Previously abstracted from original. See item 534-N, 1956. (N1; AY)

298-N. Study of Some Relationships in the Formation of Alloys of Isomorphic Borides. G. V. Samsonov and V. S. Neshpor. *Zhurnal Fizicheskoi Khimii,* v. 29, No. 5, May 1955, p. 839-845. (*Henry Brutcher Translation* no. 3997.)

Investigation of some physico-chemical properties of alloys of the system TiB_2-CbB_2—isomorphic borides of Group IV and V metals and of processes of mutual diffusion leading to the formation of alloys of titanium and columbium borides; experimental procedure involving the heating of powder mixes for various times and at various temperatures, followed by an X-ray study.
(N1, H general; Ti, Cb, *B,* 14-18)

299-N. (Hungarian.) **Effect of Traces of Impurities on the Secondary Recrystallization of Tungsten Wires.** T. Millner, J. Prohaszka and A. Horvath. *Acta Technica,* v. 17, no. 3-4, 1957, p. 289-304.

The crystal growth during recrystallization of processed tungsten wires having a fibrous structure has been observed by means of the Robinson method. Investigations were carried out at temperatures ranging from 2000-2300° K. on GK wires, containing K, Si and Al atoms in approximately 10^{-5} num. concentration (and UC wires) containing only K and Si atoms in approximately 10^{-5} num. concentration. (N5h, 3-9; W, 4-11)

300-N. (Russian.) **Recrystallization Diagram of Molybdenum.** E. M. Savitskii, V. V. Baron and K. N. Ivanova. *Akademiya Nauk S.S.S.R. Doklady,* v. 113, Apr. 11, 1957, p. 1070-1072. (CMA)

Plasticity of fine-grained molybdenum is much higher than that of coarse-grained. The desired uniform fine-grained structure is obtained by an appropriate combination of mechanical deformation and thermal treatment. The authors investigated these relationships systematically and constructed a diagram of recrystallization occurring in fine-grained molybdenum after it has been sub-

mitted to cold compression followed by annealing. 4 ref.
(N5f, M27c; Mo)

301-N. Quantitative Theory of Grain Boundary Movement and Recrystallization in Metals in the Presence of Impurities. K. Lucke and K. Detert. Brown University. (Air Force Office of Scientific Research.) *U. S. Office of Technical Services,* PB 121484, Apr. 1956, 32 p. $1.

The quantitative atomistic theory discussed rests on the assumption that interaction forces exist between the foreign atoms in solid solution and the boundary, increasing the atoms in the boundary. At high concentrations (or low temperatures) the moving boundaries are held back by the foreign atoms and the speed of the boundary is controlled by the speed of the foreign atoms diffusing beyond the boundary. At low concentrations (or high temperatures) the boundary cannot be held by the foreign atoms; breakaway occurs and the boundary moves much faster. (N3, N5, 3-19)

302-N. Grain Growth of Titanium and Titanium Alloys at Normal Hot Working Temperatures. F. R. Larson. Watertown Arsenal Laboratory, Report 401/244. *U. S. Office of Technical Services, PB 131115.* Aug. 1955, 28 p. (CMA)

Rem-Cru grades 55, 70, 130A and 130B of titanium were studied to determine grain growth at normal hot working temperatures. The alpha-beta duplex structure has one rate of grain growth and the all-beta structure another. (N3; Ti)

303-N. Tempering Phenomena in Martensite. W. Jellinghaus. *Archiv für das Eisenhüttenwesen,* v. 27, no. 7, 1956, p. 433-448. (*Henry Brutcher Translation* nos. 3876, 3928.)

Previously abstracted from original. See item 417-N, 1956.
(N8, J23, CN)

304-N. (French.) **Orientation Superstructures in Iron-Nickel Alloys.** Eric Tapley Furguson. *Comptes Rendus,* v. 244, May 6, 1957, p. 2363-2366.

Uniaxial anisotropy induced by annealing in a magnetic field was determined in relation to composition of the alloy, temperature and duration of annealing process. 7 ref.
(N5g, J23; Fe, Ni, SGA-n)

305-N. (French.) **Decomposition of Austenite Into Alpha Phase Under Effect of Latent Strains in 18-8 Type Stainless Steels.** Paul Bastien and Gilbert Stora. *Comptes Rendus,* v. **244,** May 20, 1957, p. 2613-2616.

In unstable austenites an alpha phase can appear as a result of latent strains due to cooling, or to modifications of the equilibrium of these strains by controlled dissolution. Alpha phase needles develop at a rate that can be measured perfectly by cinematography.
(N8; SS)

306-N. (German.) **Action of Liquid Zinc on Titanium.** K. Ruttewit and E. Eichmeyer. *Metall,* v. 11, Aug. 1957, p. 659-662. (CMA)

The intense dissolving action of liquid zinc on titanium was revealed in experiments with sheet and rod samples of titanium held for various lengths of time in liquid zinc at various temperatures. While the time dependence follows an approximately linear law, the effect of temperature, which is considerable almost from the melting point of zinc (419° C.), increases very rapidly, so that at 600° C. samples of titanium are completely dissolved within a few hours. 10 ref.
(N12; Zn, Ti, 14-10)

307-N. (German.) **On the Hardening of Tooth Fillings and Resulting Transition Structures of Tin-Silver Amalgams.** Rudolf Vogel and Anita Bächstaedt. *Zeitschrift für Metallkunde,* v. 48, June 1957, p. 360-366.

The transition structures produced during the hardening of silver-tin amalgams at room temperature in times up to 10 weeks are investigated microscopically and interpreted in the phase diagram.
(N7a; Sn, Ag)

308-N. (Russian.) **Phase Transformations in Chromium-Molybdenum-Iron Alloys Which Are Rich in Chromium.** N. V. Ageen, L. N. Cuseva and K. P. Markovich. *Akademiya Nauk S.S.S.R. Izvestiya Otdelenie Tekhnicheskikh Nauk,* no. 4, Apr. 1957, p. 23-32. (CMA)

Chromium-molybdenum-iron combinations containing 60% chromium, which exhibit optimum refractory and mechanical properties, change their structure on cooling from 1200° C. from that of an alpha solid solution to one containing the sigma phase which impairs both the mechanical and anticorrosive proper-

ties of the material. Kinetics of the decomposition of the solid-solution phase in the temperature range 1050-750° C. were investigated.
(N6p; Cr, Mo, Fe)

309-N. (Russian.) **Mechanism of Effect of Low-Temperature Aging of White Cast Iron on Density of Graphitization After Subsequent Annealing.** G. I. Ivantzov. *Metallovedenie i Obratka Metallov,* no. 4, Apr. 1957, p. 9-16.

Experimental data indicate that in white cast iron not exposed to preliminary hardening by deformation, graphite is formed along the lines of demarcation between eutectic cementite and hard solution. 19 ref. (N8s; CI-p)

310-N. Model for Solute Diffusion in Metals Based on Elasticity Concepts. R. A. Swalin. *Acta Metallurgica,* v. 5, Aug. 1957, p. 443-448.

In model solute ion is considered to behave as an elastic sphere. Theory is compared with solute diffusion activation energies measured experimentally in nickel and silver as solvents. 25 ref. (N1, Q21; Ni, Ag)

311-N. Growth of Voids in Metals During Diffusion and Creep. R. W. Balluffi and L. L. Seigle. *Acta Metallurgica,* v. 5, Aug. 1957, p. 449-454.

Postulation for void formation during creep. Roles of vacancy supersaturation and stress in producing voids. 22 ref. (N1, Q3, M26s)

312-N. Grain-Boundary Melting. F. Weinberg and E. Teghtsoonian. *Acta Metallurgica,* v. 5, Aug. 1957, p. 455-464.

Melting behavior of grain boundaries of bicrystal tin and bicrystal aluminum examined as a function of stress, heating rate, boundary angle and impurity concentration. 7 ref. (N12, M27f; Sn, Al)

313-N. Segregation at the Eutectic Temperature. B. C. Allen and S. Isserow. *Acta Metallurgica,* v. 5, Aug. 1957, p. 465-572.

Investigation in uranium-aluminum system of segregation effect. Effect can be amplified by repeated cycles involving alternate heating and cooling through the eutectic temperature. 7 ref.
(N12q; U, *Al,* 9-19)

314-N. Observations of Bainite Formation With the Thermionic Emission Microscope. Irwin I. Bessen. *American Society for Testing Materials, Proceedings,* v. 56, 1956, p. 415-425.

Growth of the bainite needles appears to occur by a diffusion mechanism at higher reaction temperatures. The axial growth is more rapid than the lateral growth and is directed in a definite plane. Growth may propagate to an adjacent grain of austenite after undergoing a change in direction. 3 ref. (N8m, M21e; ST)

315-N. X-Ray Study of Polygonization in Copper Single Crystals. C. T. Wei, M. N. Parthasarathi and P. A. Beck. *Journal of Applied Physics,* v. 28, Aug. 1957, p. 874-877.

Bent single crystals of electrolytic tough pitch copper and 99.999% purity copper studied. Polygonization took place only upon prolonged annealing at around 97% of absolute melting point. (N5; Cu, 14-11)

316-N. Oxygen Content of Silicon Single Crystals. W. Kaiser and P. H. Keck. *Journal of Applied Physics,* v. 28, Aug. 1957, p. 882-887.

Infrared absorption at 9 microns which is proportional to oxygen concentration in silicon was used to determine oxygen content in silicon samples of different origin and treatment. Silicon crystals pulled from a quartz crucible showed varying oxygen concentrations depending upon pulling parameters, temperature distribution in the melt and rotation rate. 22 ref. (N3r; Si, *O*)

317-N. Theory of Diffusion Constants in Interstitial Solid Solutions of b.c.c. Metals. A. Ferro. *Journal of Applied Physics,* v. 28, Aug. 1957, p. 895-900.

Mechanism of interstitial diffusion and experimental confirmation, based on evaluation of activation energy, assumed to be equal to elastic strain energy necessary in thermal fluctuation to enlarge a cavity adjacent to an occupied one to the size of the interstitial atom. 25 ref. (N1, P13a; 14-17)

318-N. Making Better Steel Sheet: Metal Behavior During Cold Rolling and Aging. H. C. Rogers. *Journal of Metals,* v. 9, Aug. 1957, p. 1034-1039.

Modern theories of dislocation and strain-aging correlated with the effects of mechanical working. 59 ref. (N7e, F23; ST, 4-3)

319-N. Metal Whiskers. *Metal Industry,* v. 91, Aug. 2, 1957, p. 94.

Briefly reviews methods used in growing tin, zinc and cadmium met-

al whiskers and factors affecting growth, physical and mechanical properties of whiskers.
(N3r; Sn, Zn, Cd)

320-N. On the Thermodynamics and Kinetics of Recovery. Michael B. Bever. Paper from "Creep and Recovery", American Society for Metals, p. 14-51.

Thermodynamic characteristics of cold worked state. Summary of published information on stored energy of cold work. Observations on release of stored energy and role in recovery process. 59 ref. (N4, P12)

321-N. Polygonization. W. R. Hibbard, Jr., and C. G. Dunn. Paper from "Creep and Recovery", American Society for Metals, p. 52-78.

Process of polygonization based on metallographic observation of bent and annealed single crystals of silicon-iron. Evidence presented as basis for considering polygonization as distinct from recrystallization. 23 ref. (N4, N5, J23)

322-N. Discussion of Hibbard and Dunn Paper on Polygonization. John J. Gilman. Paper from "Creep and Recovery", American Society for Metals, p. 79-83.

Observations of dislocations in lithium fluoride crystals.
(N4, N5, M26b; Li)

323-N. Recovery of Mechanical Properties. E. C. Perryman. Paper from "Creep and Recovery", American Society for Metals, p. 111-145.

Recovery of plastically deformed single crystals and cold worked polycrystals; effects of alloying elements on the separate recovery and recrystallization processes; effects of recovery and recrystallization on creep; relationship between recovery substructures and mechanical properties. 84 ref. (N4, N5, Q3a, 2-10)

324-N. Recovery of Internal Friction and Elastic Constants. A. S. Nowick. Paper from "Creep and Recovery", American Society for Metals, p. 146-175.

Recovery of Young's modulus and damping of deformed metals; two theories are discussed: namely, point defects created by deformation pin dislocation segments to produce recovery; and dislocation rearrangement is responsible for recovery. 48 ref. (N4, Q21, Q22, M26b)

325-N. (French.) **Micrographic Study of the Growth of Crystals by Condensation of the Vapor Phase in the Case of Cadmium.** Andre Accary and Robert Franklin Mehl. *Comptes Rendus,* v. 244, May 27, 1957, p. 2713-2716.

For supersaturations between 0.5 and 1.1, surface parallel to plane (1000) of cadmium crystals produced by condensation presents patterns of concentric microscopic layers. These patterns, which are few, are possibly centered at points of emergence of dislocations. (N15g; Cd)

326-N. (French.) **Study of the Recrystallization of Aluminum Monocrystals After Plastic Deformation.** Jean Montuelle. *Comptes Rendus,* v. 244, June 12, 1957, p. 2923-2925.

It is possible to prepare aluminum monocrystals by critical cold working of single crystals, the amount of cold working varying greatly with crystal orientation. Recrystallized crystals thus obtained are more perfect than those from which they are derived. (N5; Al, 14-11)

327-N. (French.) **Influence of the Purity and the Structure of the Metal on Intergranular Diffusion of Oxygen in Iron.** Raymond Sifferlin and Claude Bourelier. *Comptes Rendus,* v. 244, June 12, 1957, p. 2928-2929.

Microscopic study of oxide inclusions in crystals of high-purity iron refined by zone melting process showed solubility of oxygen to be extremely low or nil.
(N15e, C28k; Fe, *O*)

328-N. (French.) **Study of the Kinetics of the Martensite Transformation and the Stabilization of Austenite.** C. Crussard and J. Philibert. *Institut de Recherches de la Sidérurgie, Publications,* Ser. A, no. 156, Feb. 1957, p. 1-8. (Reprinted from *Revue de Metallurgie,* v. 53, Dec. 1956, p. 973-980.)

In determining transformation of hypereutectoid chromium steels by measuring density and dilation, and of ferronickels by measuring resistivity, it was shown that stabilization of austenite requires simultaneous presence of two factors: a chemical agent and a physical cause. Carbon or nitrogen content strongly influences kinetics of transformation. It can be shown that isothermal and anisothermal transformations proceed from a single mechanism: thermally activated germination and athermal growth. 22 ref. (N8; AY)

329-N. (French.) **Action of Nitrogen on Nickel.** J. J. Trillat, L. Tertian,

N. Terao and C. Lecomte. *Société Chimique de France, Bulletin,* no. 6, June 1957, p. 804-809.

Cubic face-centered lattice of nickel heated in current of ammonia gas is markedly dilated by introduction of nitrogen atoms into lattice. At about 175° C. dilated lattice is transformed into a hexagonal lattice, forming an Ni_3N compound. This compound, when heated under vacuum, gives ordinary nickel. Similar results are obtained by ionic bombardment of nickel by ions originating in air. These phenomena were studied by electron diffraction techniques which make possible continuous observation of the modifications which occur, as well as ionic bombardment of specimen inside the electronic instrument itself. 13 ref. (N15e; Ni, *N*)

330-N. (German.) **Kinematics of Tin Crystal Growth.** E. Anastasiadis. *Neue Hütte,* v. 2, July 1957, p. 425-440.

Microcinematographic observation of the growth of electrolytically separated tin crystals; growth rhythm; deformation of growing crystal bodies; metamorphosis of dendrites to perfect crystal octahedrons; differential and selective activity of the growing crystal zones; determination relating to time and space of the growth phenomena. 40 ref. (N12b, N12c; Sn)

331-N. (Italian.) **Structural Changes in Aluminum Alloys During Fatigue Tests.** F. Gatto. *Alluminio,* v. 26, July-Aug. 1957, p. 315-317.

Results of rotary bending tests on notched specimens confirmed that fatigue behavior of Al-Cu-Mg type alloys is determined by precipitation of copper. 3 ref. (N7, Q7c; Al, *Cu*)

332-N. (Italian.) **Dialogue Between a Steelmaker and a Machinist. Segregation in Steel.** Aldo Bartocci. *Macchine,* v. 12, July 1957, p. 649-656.

Origin, development and influence of segregations explained to machinist in informal dialogue and semi-humorous vein. (N12; ST, 9-19)

333-N. (Russian.) **Study of the Decomposition of a Supersaturated Solid Solution of Nickel-Chromium-Titanium-Aluminum.** V. G. Chorny. *Akademiya Nauk U.S.S.R. Dopividi,* no. 4, 1957, p. 362-367. (CMA)

One sample was quenched, the other strained after quenching. Changes in microstress, dimensions of the coherent X-ray scattering area and crystal lattice constants were studied, as were the hardness and state of the intermetallic alloy phase precipitated out during decomposition. (N7b; Ni, *Cr, Ti, Al*)

334-N. The Precipitation of ε-Carbide by Aging of Soft Steel. N. Hansen and E. W. Langer. *Iron and Steel Institute, Journal,* v. 186, Aug. 1957, p. 422-424.

Hardness variations observed and the formation of precipitate followed by electron microscope during aging of soft steel specimens at 250° C. First precipitate observed after maximum hardness values are past. Needle shaped precipitate assumed to be the epsilon. (N27a; CN)

335-N. Note on the Transformation of Austenitic Manganese Steel. A. E. Smith. *Iron and Steel Institute, Journal,* v. 186, Aug. 1957, p. 425-428.

Investigation of changes in microconstituents and hardness resulting from transformations in quenched austenitic (Hadfield) manganese steel, following isothermal treatments for temperatures ranging from 300 to 920° C. Isothermal transformation of austenite to austenite plus carbide and pearlite. 7 ref. (N8g; AY, *Mn*)

336-N. The Factors Which Influence the Transition From White to Gray Tin. A. I. Bykhorskii. *Soviet Physics,* v. 1, no. 8, p. 1746-1747. (Translated by American Institute of Physics.)

Explanation of influence by considering surface activity with respect to tin of contaminants present. 12 ref. (N6p; Sn)

337-N. (Czech.) **Eutectoid Reaction. Pt. 1. Pearlite Reaction in Carbon Steels.** Josef Cadek. *Hutnicke Listy,* v. 12, no. 7, 1957, p. 585-592.

Critically reviews data from literature on pearlite reaction in carbon steel; discusses various attempts on theoretical analysis of pearlite reaction and its parameters. 42 ref. (N8h, ST)

338-N. (French.) **Influence of Variations in Austenite Composition on Tempering Characteristics of Thermal Martensite in 18% Chromium and 2, 4, or 6% Nickel Steels.** Paul Bastien and Alain Sulmont. *Comptes Rendus,* v. 244, June 17, 1957, p. 3056-3059.

Influence of variations of austenite composition can be quite accurately

studied by determining, by means of dilatometry, shifts in Ms point. (N8p; AY, *Cr, Ni*)

339-N. (German.) **Behavior of Non-Alloyed Carbon Steels Toward Hydrogen Under Plastic Deformation.** Friedrich Erdmann-Jesnitzer. *Archiv für das Eisenhüttenwesen,* v. 28, May-June 1957, p. 355-365.

The influence of plastic deformation such as upsetting was investigated on iron cylinders, after cathodic loading with hydrogen. The results show that the release of hydrogen takes place mainly when reaching the yield point. The releasing speed surpasses the normal over 100 times. Also the quantity of hydrogen released is greater. Explanation of hydrogen embrittlement is given. 26 ref.
(N15d, Q26s, Q24; Fe, CN, *H*)

340-N. (German.) **Influence of Electrolytic Transfer of Carbon on the Aging of Alpha-Iron.** Friedrich Erdmann-Jesnitzer and Klaus Ouvrier. *Archiv für das Eisenhüttenwesen,* v. 28, July 1957, p. 423-431.

To prove the existence of carbon ions in alpha-iron the following experiments were carried out; transfer of carbon at a temperature of 700 to 800° C.; observation of the quench-aging process through continuous measuring of hardness and electrical resistance with or without additional current. At 825° C. diffusion of carbon toward the cathode was observed proving the existence of carbon ions. The valence was found to be between +2 and +3.6 depending on the current density.
(N7a; Fe, *C*)

341-N. (German.) **Martensitic Transformations in the Forming of Homogenized Beta Brass.** Erhard Hornbogen, Armin Segmüller and Günter Wassermann. *Zeitschrift für Metallkunde,* v. 48, July 1957, p. 379-384.

The behavior of homogenized B-Ms60 both as single crystals and as polycrystals is investigated in the forming process. Beta$_1$ is transformed under tensile stress into martensitic crystals. The new phase may be described as being an alpha-brass with straightened out tetragonal structure of the CuAu-type. In the form of transformation between beta$_1$ and alpha$_1$ an unknown structure alpha$_2$ of a lower symmetrical order exists. 10 ref.
(N6q, 3-18; Cu-r)

342-N. (German.) **Observations With an Electron Microscope on the Structural Changes Taking Place in the Drawing and Recrystallization Process of Copper Wire.** Walter Feitknecht and Edgar Freudiger. *Zeitschrift für Metallkunde,* v. 48, July 1957, p. 384-390.

Electrolytic copper of various degrees of purity is examined as to its substructure after various deformation and recrystallization treatments. The different forms of the substructure may be explained by the fact that the attack of the etching agent starts at points of accumulation of dislocations and proceeds along directions of lightest rate of solution, especially along (111) and (110) directions. 10 ref.
(N5, M21e; Cu, 4-11)

343-N. (German.) **Observations With an Electron Microscope on the Precipitation of Copper From Cyanidic Electrolytics Along the Boundary Line Between Films.** Ludwig Reiner. *Zeitschrift für Metallkunde,* v. 48, July 1957, p. 390-393.

The precipitation of copper films of various thicknesses from cyanidic electrolytes on a coarse-grained carrier metal and a copper single crystal is examined using electron microscope bright and dark field observation. Nickel films are used as replicas. Information is obtained about the crystalline structure of films. 3 ref. (N12d, M21e; Cu, 14-12)

344-N. (German.) **Precipitation of Bismuth in Copper.** Guido Bassi. *Zeitschrift für Metallkunde,* v. 48, July 1957, p. 394-395.

Observation of copper with .015% Bi has shown that accumulations of bismuth may occur in materials which were not previously subjected to severe deformation at temperatures beyond 900° C. This may be due to the cast structure. An artificial precipitation of bismuth can be obtained by a slight deformation and annealing at 500° C. The solubility of bismuth in copper turned out to be at least 0.015% which is more than assumed up to the present. 3 ref. (N7, P12e; Cu, *Bi*)

345-N. (German.) **On the Origin of Stains Appearing on the Surface of Cathodic Copper Subjected to Fatigue Strain.** Masahiko Suzuki. *Zeitschrift für Metallkunde,* v. 48, July 1957, p. 395-398.

Formation of stains on copper-plated material is due to the fatigue of the copper-plating itself; the structural changes causing the

stains start from the boundary between base metal and plated metal and proceed toward the surface. Progress depends on the number of stress repetitions. 6 ref.
(N12d, Q7, L17; *Cu)*

346-N. (Japanese.) **Study on Acicular Cast Iron; the Effect of Manganese.** Yoichi Tokunaga. *Casting Institute of Japan, Journal,* v. 29, April 1957, p. 215-217.

Iron-molybdenum-copper-manganase system studied; cooling curves of molybdenum-manganese cast iron; martensite-acicular-pearlite transformation. (N8; CI-q)

347-N. (Russian.) **The Influence of Alloying Elements on the Content and Mobility of Hydrogen in Steel.** Yn. A. Kliachko & T. A. Izmanova, *Stal',* v. 17, 1957, p. 507-511. (*Henry Brutcher Translation* no. 4047.)

Which alloying elements aid release of hydrogen at comparatively low temperatures, and which hamper it. Influence on plastic deformation. (N15d, Q24, 2-10; ST, *H)*

348-N. Grain Growth and Recrystallization Studies on Commercial Titanium, RC-55, and Alloy, Ti-100 A. E. L. Bartholomew, Jr. *American Society for Metals, Transactions,* v. 50, Preprint No. 1, 1957, 19 p.

The influences of prior to deformation grain size, amount of cold deformation, annealing temperature and time on the grain size of cold worked and annealed titanium (RC-55) and alloy (Ti-100A) were investigated. Isothermal annealing of cold rolled titanium (RC-55) was also carried out to establish recrystallization rates and to investigate grain growth in the absence of recrystallization. 9 ref.
(N3, N5, 2-14, 3-18; Ti)

349-N. Growth of Cadmium From the Vapor. J. E. McNutt and R. F. Mehl. *American Society for Metals, Transactions,* v. 50, Preprint No. 6, 1957, 39 p.

Technique for making continuous microscopic and interferometric observations of cadmium crystals while they are actually growing by deposition from cadmium vapor at constant temperature and supersaturation. Selected observations on the changes occurring on basal hexagonal surfaces during experiments with various supersaturations and deposit temperatures within 50° C. of the melting point are reported. 17 ref. (N15g; Cd)

350-N. Solubility of Carbon in Thorium. Robert Mickelson and David Peterson. *American Society for Metals, Transactions,* v. 50, Preprint No. 7, 1957, 14 p.

The solubility of carbon in thorium has been investigated and the limit of solubility has been determined at four temperatures. X-ray data, hardness readings and metallographic examinations of heat treated specimens were combined to obtain the following solubility limits; room temperature-0.35% carbon, 800° C.-0.43% carbon, 1018° C-0.57% carbon, and 1215° C.-0.91% carbon. (N12p, Th, C)

351-N. Classification of Precipitation Systems. R. O. Williams. *American Society for Metals, Transactions,* v. 50, Preprint No. 13, 1957, 13 p.

It is proposed that all precipitation systems be classified according to three structural characteristics: degree of complexity of nucleation, the shape of the particles formed and the degree of order in the matrix and precipitate. 17 ref.
(N7b)

352-N. Transformation Kinetics and Mechanical Properties of Zr-Ti and Zr-Sn Alloys. R. F. Domagala, D. W. Levinson and D. J. McPherson. *American Society for Metals, Transactions,* v. 50, Preprint No. 19, 1957, 26 p.

Three zirconium-titanium and three zirconium-tin alloys based on sponge zirconium were prepared by arc melting and forging. Transformation kinetics of these alloys were investigated. The zirconium-titanium compositions, prototypes of alpha and beta isomorphous alloys, demonstrated a general lack of response to heat treatment. Significant improvements in impact strength and optimum conditions for other mechanical properties were developed by finish-forging 5 and 15% Ti alloys in the alpha and beta field. A correlation between hardness and tensile strength was observed. 7 ref.
(N6, N7, Q general, Zr, Ti, Sn)

353-N. Transformation Kinetics of Zirconium-Uranium Alloys. D. L. Douglass, L. L. Marsh, Jr., and G. K. Manning. *American Society for Metals, Transactions,* v. 50, Preprint No. 20, 1957, 25 p.

The transformation kinetics of zirconium alloys containing 8.85, 11.1, 14.3, and 20.7 % uranium have been determined by metallography and X-ray diffraction. The effect of increasing uranium content in the

alloys was to retard alpha zirconium precipitation and to accelerate the precipitation of supersaturated epsilon, an intermediate phase. 6 ref. (N6, N7; Zr, U)

354-N. Effect of Aging Cycle on the Properties of an Iron Base Alloy Hardened with Titanium. T. W. Eichelberger. *American Society for Metals, Transactions,* v. 50, Preprint No. 21, 1957, 34 p.

Aging treatment that increases the creep-rupture time for both plain and notch-bar specimens. The notch sensitivity of the material in creep has been greatly reduced by this new aging treatment; however, no change has been produced in the room temperature or 1200° F. tensile properties. 9 ref.
(N7a, J27d, Q3m, Q23s; Fe, Ti)

355-N. Transformation Structures in Hypoeutectoid Alloy Steels. W. C. Hagel and M. N. Ruoff. *American Society for Metals, Transactions,* Preprint No. 25, 1957, 27 p.

Detailed optical and electron-microscopic observations were made of the morphological aspects of both isothermal and cooling transformations in laboratory Ni-Mo, Cr-Mo-V and Ni-Cr-Mo steels containing 0.3% carbon. Transformation curves were obtained by varying isothermal-reaction temperatures from 1300 to 700° F. (705 to 370° C.) and cooling rates from 9 to 30,000 F/hour; resultant structures are more continuous and intermixed in nature than existing classifications indicate. 20 ref. (N8g; AY)

356-N. Phase Relationship in Austenitic Cr-Mn-C-N Stainless Steels. Chi-Mei Hsiao and E. J. Dulis. *American Society for Metals, Transactions,* v. 50, Preprint No. 29, 1957, 43 p.

The stable austenite region in the Cr-Mn-C-N steels containing 0.10/0.80% C, 10/28% Mn, 12/28% Cr, and 0.10/0.80% N has been determined. At 2100° F., the minimum amount of carbon plus nitrogen required for a completely austenitic structure increases with increasing amounts of chromium, and this relationship can be represented by the expression $C+N = 0.078$ (Cr-12.5). When the chromium is over 15%, about 12% manganese is required to stabilize the austenite, and when the chromium is between 12 and 15%, 12 to 18% manganese is required. 25 ref. (N8, N7a; SS-e)

357-N. Morphological and Phase Changes Durnig Quench-Aging of Ferrite Containing Carbon and Nitrogen. G. Lagerberg and B. S. Lement. *American Society for Metals, Transactions,* v. 50, Preprint No. 33, 1957, 33 p.

The quench-aging of a Fe-C alloy (0.016% C), a Fe-N alloy (0.084% No), and two Fe-C-N alloys (0.021% C, 0.028% N and 0.023% C, 0.011% N) was studied by means of light microscopy, electron microscopy and electron diffraction. The following two-stage reactions were found to occur: ferrite supersaturated with carbon→epsilon carbide→cementite; ferrite supersaturated with nitrogen → alpha''-nitride → gamma' nitride; ferrite supersaturated with both carbon and nitrogen epsilon→ carbonitride→cementite. 21 ref.
(N7a; CN)

358-N. The Mode of Hydride Precipitation in Alpha Titanium and Alpha Titanium Alloys. Tien-Shih Liu and Morris A. Steinberg. *American Society for Metals, Transactions,* v. 50, Preprint No. 34, 1957, 47 p.

Under favorable conditions of hydride precipitation and growth, the appearance of the hyrrides in unalloyed and alloyed (Ti-3% Al, Ti-3% Ta, Ti-2% V, and Ti-10% Zr) alpha titanium are basically the same —thin needles. The precipitation tends to take place along slip lines and twin markings, when the surface energies are higher than surrounding areas. (N7b; Ti)

359-N. Factors Affecting the Absorption and Distribution of Hydrogen in Titanium During Acid Pickling. C. R. McKinsey, M. Stern and R. A. Perkins. *American Society for Metals, Transactions,* v. 50, Preprint No. 38, 1957, 25 p.

Hydrogen pickup results from corrosion of the metal and can be minimized by passivation of the surface or alteration of the cathodic reaction. Hydrogen pickup in predominantly alpha alloys is shown to be confined to a thin surface layer which is stable at temperatures below 100° C. 19 ref. (N15a, L12g; Ti)

360-N. Some Aspects of the Morphology and Chemistry of Lead in Leaded High Sulphur Steels. J. W. Thurman, E. J. Paliwoda and E. J. Duwell. *American Society for Metals, Transactions,* v. 50, Preprint No. 50, 1957, 28 p.

An experimental ingot of leaded high sulphur steel has been examined, with the aid of microradiog-

raphy, in both the as-cast and hot rolled conditions. It appears that virtually all the lead can be revealed by a microradiographic technique. The processes of solidification cause the lead to become entrapped in the same interdendritic regions in which manganese sulphide (and other nonmetallic) form. Thus, lead and manganese sulphide remain in close physical association in the steel. 16 ref. (N12c, M23n; AY, Pb)

361-N. Grain Boundary Self-Diffusion of Nickel. W. R. Upthegrove and M. Sinnott. *American Society for Metals, Transactions,* v. 50, Preprint No. 52, 1957, 30 p.

The diffusion of Nickel-63 into controlled orientation bicrystal grain boundaries of nickel in the temperature range 700-1100° C. has been studied using autoradiographic techniques. The ratio of the grain boundary diffusion coefficient to the lattice diffussion coefficient has been shown to vary from 10^3 to 10^7, depending on the grain boundary angle and the temperature of diffusion. 13 ref. (N1d; Ni)

362-N. Effect of Interstitial Atoms on the Self-Diffusion of Metal. M. A. Krivoglaz and A. A. Smirnov. Problems of Metal Physics and Metallography, a Collection of Papers from the Metal Physics Laboratory of the Ukrainian Academy of Sciences, no. 5, 1954, p. 128-137. (*Henry Brutcher Translation* no. 3929.)

Drop of the energy of activation for self-diffusion of iron in lattice of gamma iron and exponential reduction of pre-exponential factor in equation for diffusion coefficient, both brought about by the addition of minute amounts of carbon. Theoretical interpretation of this phenomenon based on simple concepts about diffusion in alloys. (N1d, P13a)

363-N. Formation of Sigma Phase in High-Alloy Austenitic Steels and Alloys. E. M. Pivnik. *Fizika Metallov i Metallovedenie,* v. 2, no. 3, 1956, p. 531-537. (*Henry Brutcher Translation* no. 3981.)

Previously abstracted from original. See item 459-N, 1956. (N8, AY)

364-N. Mechanism of Action of Aluminum Upon Secondary Austenite Grain in Steel. D. S. Kamenetskaya and I. B. Piletskaya. Problems of Metallography and Metal Physics, 4th Collection of Papers, 1955, Moscow, p. 103-112. (*Henry Brutcher Translation* no. 4033.)

Effect of aluminum dissolved in steel upon the nucleation of secondary austenite centers and on their growth. Conclusions drawn as to influence of aluminum on boundary and surface energies and on activation energy in nucleation and growth of secondary austenite. (N2, N3, P13A; ST, *Al*)

365-N. Use of Tritium for Study of Behavior of Hydrogen in Metals. A. I. Chizhikov and V. K. Boyarshinov. *Zavodskaya Laboratoriya,* v. 23, no. 1, 1957, p. 11-14. (*Henry Brutcher Translation* no. 4039.)

Usefulness of tritium for obtaining information on bond strength, diffusion and solubility of hydrogen in metals and alloys; arrangement for preparing gaseous hydrogen containing tritium; details on a counter for recording the beta radiation of tritium; set-up for loading metals and alloys with tritium-labeled hydrogen and for its extraction from metals and alloys. (N15d, *H*)

366-N. (Czech.) **Influence of Tungsten on the Kinetic Parameters of the Formation of Hypo-Eutectoid Ferrite.** Karel Mazanec and Josef Cadek. *Hutnicke Listy,* v. 12, no. 6, 1957, p. 492-500.

Influence of tungsten on the velocity of nucleus formation and the growth of hypo-eutectoid ferrite in the isothermal disintegration of austenite. Relation between effect of tungsten on nucleus formation incubation period and temperature. 23 ref. (N2, N8; ST, *W*)

367-N. (French.) **Micrographic Observation of the Recrystallization, at Low Temperature, of Aluminum Refined by the Zone Melting Process.** Philippe Albert and Omourtague Dimitrov. *Comptes Rendus,* v. 245, Aug. 5, 1957, p. 681-683.

Development of new method of electrolytic polishing and anodic oxidation of pure aluminum at low temperature (−60° C.) made it possible to determine micrographic structure of specimens recrystallized at −38° C. after 97% reduction by cold rolling. (N5, 2-13, M20p; Al)

368-N. (French.) **Bainitic Transformation in Steels.** L. Habraken. *Revue de Metallurgie,* v. 53, Dec. 1956, p. 930-944.

Study by means of electronic metallography of bainitic transformation in hypereutectoid carbon or alloy steels; mode of formation of pro-

bainitic ferrite; reasons for stabilization of austenite; how granular and acicular transformations occur; development of bainitic transformation. 17 ref. (N8m; ST)

369-N. Nucleation of Crystalline Ta_2O_5 During Field Crystallization. D. A. Vermilyea. *Electrochemical Society, Journal,* v. 104, Sept. 1957, p. 542-546.

Field crystallization occurs only at certain preferred nucleation sites at the metal-oxide interface. Incubation period corresponds to time required for a crystal growing underneath the amorphous oxide film to reach a critical size. Logarithm of incubation period increases linearly with decreasing eletcric field at constant temperature. 6 ref. (N12, L19; Ta)

370-N. Kinetics of Metal Deposition. T. Pavlopoulos and J. D. H. Strickland. *Electrochemical Society, Journal,* v. 104, Sept. 1957, p. 568-574.

Discharge characteristics of the deposition of lead, thallium, silver, bismuth, copper, tin, and antimony ions onto the solid metals, using constant current voltammetry are reported. Parameters needed to describe deposition onto solid surfaces are discussed. 33 ref. (N12d, L17; Pb, Th, Ag, Bi, Cu, Sn, Sb)

371-N. Investigation of the Allotropic Transformation $\alpha \rightleftarrows \beta$ Zr With the Aid of an Electronic Projector. A. P. Komar and V. N. Shrednik. *Soviet Physics—JETP,* v. 5, Aug. 1957, p. 127-128. (CMA) (Translated by American Institute of Physics)

The transformation of zirconium was observed by electronic projector. The preparation of the specimen is described. The process of beta-alpha transformation was not always geometrically reversible. In all the observed cases for the mutual orientation of the crystal the original and new phases satisfied the relations found by Burgers with X-rays. The theoretical number of new orientations for transitions is not realized since the tendency is toward a minimum change in surface energy. 4 ref. (N6p; Zr)

372-N. Subgrain and Electrical Resistivity Studies of Molybdenum Single Crystals. K. T. Aust and R. Maddin. Johns Hopkins University, Report Under Contract Nonr-248(05). *U. S. Office of Technical Services,* PB 124493. July 1955, 24 p.

The conditions under which polygonization or subgrain formation occur in bent single crystals of molybdenum were studied. Electrical resistance measurements were made to get a quantitative idea of the changes during recovery and polygonization. (N3, N4, P15g; Mo, 14-11)

373-N. Effect of Stress on the Recrystallization of Lead During Creep. R. C. Gifkins. *Institute of Metals, Journal,* v. 86, Sept. 1957, p. 15-16.

Strain necessary to initiate recrystallization during creep of high-purity lead has been determined for the range of stresses from 300 to 1500 psi. (with constant loads). Results appear to be best fitted by an exponential law, recrystallization occurring at higher strains with higher stresses. 6 ref.
(N5, Q3, 3-16; Pb)

374-N. Dynamic Solution - Rate Studies of Solid Metals in Liquid Metals. A. G. Ward and J. W. Taylor. *Institute of Metals, Journal,* v. 86, Sept. 1957, p. 36-42.

Study of the kinetics of solution of solid copper in liquid lead and bismuth under dynamic conditions in the range 360-460° C. Complete concentration-time curves were determined for the copper-lead and copper-bismuth systems at two temperatures. 4 ref.
(N12p; Cu, Pb, Bi)

375-N. Kinetics of Zirconium-Uranium Dioxide Reaction. M. W. Mallett, et al. Battelle Memorial Institute. *U. S. Atomic Energy Commission,* BMI-1028, Aug. 15, 1955, 64 p. (CMA)

Data indicate that zirconium jacket walls next to uranium dioxide would undergo destructive embrittlement in 300 days at 1300° F. and 2.5 days at 2000° F.
(N1, Q26s, Zr, U)

376-N. Fabrication of Zircaloy-2 Clad U-Mo and U-Nb Rods for Irradiation in the Materials Testing Reactor. W. B. Haynes. Westinghouse Atomic Power Division. *U. S. Atomic Energy Commission,* WAPD-FE-1105, Oct. 31, 1955, 50 p. (CMA)

Zircaloy-2 clad fuel elements were subjected to irradiation to study the diffusion zones formed between cladding and fuel. Some areas of the zones are not corrosion resistant and corrode quickly if under a fault in the cladding. It is therefore desirable to minimize diffusion to a degree consistent with a good metallurgical bond.
(N1h, 2-17; Zr, U, 8-16)

377-N. Magnesium-Zirconium Diffusion Studies. L. S. DeLuca, H. T. Sumsion and D. D. Van Horn. Knolls Atomic Power Laboratory, *U. S. Atomic Energy Commission*, KAPL-1746, Apr. 1, 1957, 27 p. (CMA)

The rate of interdiffusion between magnesium and zirconium in the 500-640° C. range was studied by metallographic methods. Magnesium embrittled zirconium but did not change the microstructure. Zirconium diffusion into magnesium forms two zones. 8 ref. (N1e; Mg, Zr)

378-N. Zirconium-Uranium Dioxide Reaction. M. W. Mallett, et al. Battelle Memorial Institute. *U. S. Atomic Energy Commission*, BMI-1210, July 22, 1957, 67 p. (CMA)

The solid-solid reaction between zirconium and UO_2 was studied with sandwich-type elements in the 750-2000° F. range in which months of heating were needed to produce measurable reaction rates. At 1300° F., rates were measurable in one month, and above 1600° F., in a few hours. UO_2 goes into zirconium as uranium and oxygen, diffusing at unequal rates. 13 ref.
(N1, 2-12; Zr, U)

379-N. Preferred Orientations and Kinetics of Recrystallization in Titanium. C. J. Sparks, Jr., and J. P. Hammond. Wright Air Development Center, Technical Report 56-421. *U. S. Office of Technical Services*, PB 121693, July 1956, 73 p. (CMA)

Preferred orientations were produced in titanium by cold rolling and cross rolling and in Ti-Al alloys by cold rolling. They were then annealed and reorientations were studied with an X-ray diffractometer. The process of recovery and recrystallization occur almost simultaneously for cold rolled titanium. Both Ti-Al and titanium had a predictable variation of yield strength in the rolling direction by applying the law of critical resolved shear to the pole figures. Kinetics, grain growth, hardness and line breadth recovery were studied.
(N5, N4; Ti)

380-N. Investigation of a New Method for the Determination of the Coefficients of Surface Diffusion of Metals. P. F. Mataich. Horizons, Inc. (Air Force Office of Scientific Research.) *U. S. Office of Technical Services*, PB 121956, Sept. 1956, 65 p. $1.75.

Three methods for determining surface diffusion coefficients were evaluated, each with a basically different type of measurement. An optical method followed height changes of a diffusing strip using interferometric measurements. An autoradiographic technique utilized photographic processes to trace progress of diffusing atoms. An electrolytic method used a solid electrolyte to transform mass flow of diffusing atoms into an electric current. The interferometric method was found to give consistently reproducible results with a very flat base surface. (N1a, 1-3)

381-N. (English.) **On the Magnetic Aging of Commercial Pure Iron.** Mitsuru Asanuma and Shinji Ogawa. *Physical Society of Japan, Journal*, v. 12, Aug. 1957, p. 955-958.

Origin of magnetic aging is explained in terms of initial magnetic susceptibility and internal friction and is credited to very small amounts of carbon and nitrogen in iron, effect of nitrogen being the more marked. Magnetic aging occurs principally during formation of intermediate nitride. Reasons are suggested for different effects of carbon and nitrogen. 14 ref.
(N7a, P16; Fe-a)

382-N. (French.) **Isotope Exchange and Evolution on Metal Surfaces in Electrolytic Solutions.** U. Camerini, J. Danon and M. Malagolowkin. *Journal de Chimie Physique*, v. 54, July-Aug. 1957, p. 527-532.

Spontaneous deposits of thorium carbide on several metals were prepared on basis of solutions containing metal ions. Autoradiography of deposits was carried out by Ilford C-2 nuclear emulsions. Statistical distribution of path of alpha rays in emulsion revealed that during isotope exchange between metal and its ions a fraction of the radioactive atoms penetrate inside the metal. Depth of penetration was calculated on basis of statistical distribution of path. This penetration is attributed to alterations undergone by metal surfaces during exchange process. 14 ref. (N12d)

383-N. (French.) **Investigation of the Intermetallic Diffusion Phenomena in the System Uranium-Zirconium.** Y. Adda, J. Philibert and H. Faraggi. *Revue de Metallurgie*, v. 54, Aug. 1957, p. 597-610. (CMA)

Investigations reveal an extremely pronounced Kirkendall effect. This implies that the intermetallic dif-

fusion mechanism in this system is in accordance with the recent results obtained with beta-brass and with the Ti-Mo system, and more generally with metals of face-centered cubic structure. A vacancy mechanism of diffusion in these systems seems to be the case, rather than the ring mechanism suggested by Zener and LeClaire. 20 ref. (N1e; U, Zr)

384-N. (Russian.) **Diffusion in Alloys of Titanium With Columbium.** N. V. Grump Grzhimailo. *Akademiya Nauk S.S.S.R., Izvestiya, Otdelenie Tekhnicheskikh Nauk,* no. 7, July 1957, p. 24-28. (CMA)

Study of various aspects of diffusion in multiphase crystalline bodies using tablets prepared of compressed mixtures of powdered titanium and columbium and covered with a layer of powdered titanium irradiated so as to produce a titanium isotope (half-life several seconds) which decays into beta-radioactive scandium^{46} (85 days). (N1e; Ti, Cb)

385-N. (Russian.) **Study of Carbon Diffusion in Nickel and Its Alloys Using Radioactive Isotope C14.** P. L. Gruzin, Yu. A. Polikarpov and G. B. Fedorov. *Fizika Metallov i Metallovedenie,* v. 4, no. 1, 1957, p. 94-102.

Detailed results of investigation of carbon diffusion in nickel, nickel-chromium and nickel-molybdenum alloys. Method of determination of carbon diffusion constant. 3 ref. (N1; Ni, C)

386-N. (Russian.) **Relaxation of Stresses in Aluminum-Magnesium Alloys.** M. G. Gaidukov and V. A. Pavlov. *Fizika Metallov i Metallovedenie,* v. 4, no. 1, 1957, p. 123-130.

Relaxation of stresses of Al-Mg alloys in the range of 100-300° C. and at initial strain of 300 g. per sq. mm. Al-Mg alloys show greater relaxation firmness in comparison with pure aluminum. This is explained by deformation of crystalline structure due to pressure of the magnesium atoms and their diffusion under load and not by the increase of inter-atom binding forces. 4 ref. (N4; Al, Mg)

387-N. (Russian.) **Mechanism of Nodular Graphite Formation in Cast Iron.** I. E. Bolotov, V. I. Syreishchikova and S. G. Guterman. *Fizika Metallov i Metallovedenie,* v. 4, no. 1, 1957, p. 177-180.

Conditions of formation of nodular graphite. Redistribution of sulphur in nodular and flake graphite. Influence of radioactive Ca_{45} upon formation of nodular graphite. 14 ref. (N8s; CI-r)

388-N. (German.) **Measuring Technique for Kirkendall Effect in Metals.** W. Karger. *Zeitschrift für Physikalische Chemie,* v. 12, July 1957, p. 8-12.

Enables a continuous tracing of effect during experiments and precise quantitative determination of change in process itself. (N1, 1-4)

389-N. (Japanese.) **Grain Size Control and Some Property Changes of Al-Mn Alloy Sheet During the Manufacturing Process.** Eiichi Hata and Katsuzi Takeuchi. *Sumitomo Metals,* v. 9, Apr. 1957, p. 1-13.

Experiments to show the effect of impurities and preheating on grain size of Al-Mn alloy sheets. Recrystallized grains were refined and reduced in size and mechanical properties were improved when the ingot was heated prior to hot rolling; addition of iron refined the grain while presence of silica reduced the iron effect; annealing and cold rolling of hot rolled plate caused a difference in grain size at the surface. 6 ref. (N3, 2-10; Al, *Mn,* 4-3)

390-N. (Russian.) **Use of Rare-Earth Elements for Preventing the Formation of "Whiskers" During the Crystallization of Steel.** V. M. Tageev and Yu. D. Smirnov. *Stal',* v. 17, Sept. 1957, p. 823-828. (CMA)

The formation of "whiskers" (i.e., accumulations of sulphur, and other impurities), due to differences of solubility in the solid and liquid phases of solidifying steel, can be effectively avoided by treating liquid steel with a mixture of rare earth elements (cerium, lanthanum, etc.) in amounts of 0.10-0.020%. In the presence of these elements the separation of sulphide phases occurs at earlier stages of crystallization and is thus more uniformly distributed. (N12, 2-10; ST, AD-p, EG-g)

SECTION P

PHYSICAL PROPERTIES and TEST METHODS

1-P. The Thermal Expansion of Aluminium at Low Temperatures as Measured by an X-Ray Diffraction Method. B. F. Figgins, G. O. Jones and D. P. Riley. *Philosophical Magazine,* v. 1, ser. 8, no. 8, Aug. 1956, p. 747-758.

Accurate determination of lattice cell dimensions. Results represent a tendency for the Grüneisen constant to increase at the lowest temperatures. (P11, M22, 2-13; Al)

2-P. The Thermal Expansion of Pure Metals and the Possibility of Negative Coefficients of Volume Expansion. J. H. O. Varley. *Royal Society, Proceedings,* v. 237, ser. A, Nov. 6, 1956, p. 413-421.

Factors controlling the volume thermal expansion of solids. The negative coefficient of volume expansion of the cubic phase in plutonium. (P11; Pu)

3-P. (English.) **Hydrogen Overpotential of ε Phases.** Namio Ohtani. *Science Reports of the Research Institutes, Tohoku University,* ser. A, v. 8, no. 5, Oct. 1956, p. 399-405.

Hydrogen overpotential of silver and copper alloys measured by direct method. Cohesion is strong, bond energy is large and compressibility and effective number of free electrons per atom are small. (P15, M26; Ag, Cu)

4-P. (French.) **Resistivity in Very Thin Metallic Films.** Genevieve Darmois. *Comptes Rendus,* v. 243, no. 15, Oct. 8, 1956, p. 1024-1026.

Possible existence of a two-dimensional electronic gas between the separate particles produced by metal deposition. The Mostovetch law explains the small variations in the size of metal drops. (P15; 1-5)

5-P. (French.) **Measurement of the Hall Effect on Diamagnetic Palladium Metal Alloys.** Joseph Cohen. *Comptes Rendus,* v. 243, no. 16, Oct. 15, 1956, p. 1105-1107.

A measurement of the Hall effect to 5% was performed on these alloys and compared with the concentration of δ-electrons. (P16, P15; Pd, Re, Ag, Ti)

6-P. (French.) **Influence of Mechanical Stresses on Secondary Electron Emission of Polycrystalline Metallic Substances.** Francois Davoine and René Bernard. *Journal de Physique et le Radium,* v. 17, no. 10, Oct. 1956, p. 859-865.

Test showed that the coefficient of secondary emission d can grow up to 20% with nickel, gold and molybdenum under the influence of plastic deformation. The initial value of d is restored by annealing. (P15k, Q24; Ni, Au, Mo)

7-P. (French.) **Activity of Carbon in Liquid Iron-Carbon Solution.** André Rist and John Chipman. *Revue de Métallurgie,* v. 53, no. 10, Oct. 1956, p. 796-807.

Data for the equilibrium between carbon dioxide and carbon monoxide at 1360, 1460 and 1560° C. (P12b; Fe)

8-P. (German.) **Overvoltage Effects on Bimetallic Electrodes. I.** Willi Machu and M. G. Fouad. *Werkstoffe und Korrosion,* v. 7, no. 10, Oct. 1956, p. 560-566.

Hydrogen overvoltages on mercury, zinc, lead, cadmium, nickel and platinized platinum in acetate buffer solutions. Hydrogen overvoltages of bimetallic electrodes such as zinc-copper, lead-copper, and lead-platinized platinum investigated under varying surface conditions. (P15; Hg, Zn, Pb, Cd, Ni, Pt)

9-P. (German.) **Equilibrium and Kinetic Phenomena in the Liquid Ternary Systems Au-Sd-Hg and Au-**

Zn-Hg. Hermann Hartmann and Karl Schölzel. *Zeitschrift für Physikalische Chemie (Frankfurt)*, v. 9, no. 1-2, Oct. 1956, p. 106-126.

Determination of temperature effect; thermodynamic data on the systems. (P12; Au, Cd, Zn, Hg)

10-P. (Russian.) **Heat Conductivity and Temperature Conductivity of Cast Irons.** B. B. Kuprovskii and P. V. Gel'd. *Liteinoe Proizvodstvo*, no. 9, Sept. 1956, p. 16-18.

Dependence of heat and temperature conductivity in cast iron on the form of its carbon constituents. (P11; CI)

11-P. (Russian.) **Effect of Insoluble Inclusions on the Viscosity of Melted Metals During Supercooling.** G. I. Goriaga and E. G. Shvidkovskii. *Moskovskogo, Universiteta, Vestnik, Seriia Fiziko-Matematicheskikh i Estestvennykh Nauk*, v. 11, no. 6, June 1956, p. 33-37.

Effect of amount of inclusions and related structural changes. Heterogeneous system and viscosity. (P10f; 9-19)

12-P. The Temperature-Dependent and Temperature-Independent Parts of the Increase of Resistance Due to Impurities in a Metal. A Simple Method of Obtaining Their Ratio. A. N. Gerritsen and J. M. L. C. Van Der Aa. *Applied Scientific Research*, v. 6, sec. A, no. 2-3, 1956, p. 191-196.

A linear relation between the average temperature coefficient of resistivity of a diluted alloy between 273 and 373° K. and the residual resistance measured below 4° K. gives a quantitative determination of the ratio between the temperature-dependent and temperature-independent parts of the increase of resistance of the base metal caused by alloying.
(P15g, 2-11; Co, Ni, Cu, Fe, Au)

13-P. The Specific Heats of Cadmium and Mercury. P. L. Smith and N. M. Wolcott. *Philosophical Magazine*, v. 1, ser. 8, no. 9, Sept. 1956, p. 854-865.

Measurements at 1.3 to 20° K. (P12r; Cd, Hg)

14-P. Magnetic Domains in Evaporated Thin Films of Nickel-Iron. Charles A. Fowler, Jr., Edward M. Fryer and John R. Stevens. *Physical Review*, v. 104, ser. 2, Nov. 1, 1956, p. 645-649.

In a series of six films ranging in thickness from 20,000° A to 500° A, domain patterns were photographed in all but the thickest two.
(P16c; Ni, Fe, 14-12)

15-P. Piezoresistance in Bismuth. R. W. Keyes. *Physical Review*, v. 104, ser. 2, Nov. 1, 1956, p. 665-666.

Piezoresistance phenomena are consistent with some of the multivalley models of bismuth previously proposed. (P15; Bi)

16-P. (German.) **Effect of Plastic Deformation on the Magnetic Properties of Nickel Single Crystals. I. Plastic Stress-Strain Curve and the Fatigue Law in Magnetic Saturation.** Hermann Dietrich and Eckart Kneller. *Zeitschrift für Metallkunde*, v. 47, no. 10, Oct. 1956, p. 672-684.

The law of approach to magnetic saturation was investigated at room temperature as a function of plastic deformation of nickel single crystals of different orientation.
(P16, Q24, Q25r; Ni, 14-11)

17-P. (German.) **Properties of Molten Metals. IIX. Internal Friction of Liquid Gold-Tin Alloy.** Erich Gebhardt, Manfred Becker and Konrad Köstlin. *Zeitschrift für Metallkunde*, v. 47, no. 10, Oct. 1956, p. 684-687.

Viscosity of gold-tin melts up to 70% gold and 900° C.
(P10f, Q22; Au, Sn)

18-P. Some Experiments on the Determination of the Latent Heats of Transition of Titanium and Iron. T. H. Schofield. *Institute of Metals, Journal*, v. 85, Oct. 1956, p. 68-70.

Latent heats of the $\alpha \rightarrow \beta$ transition in titanium and the $\alpha \rightarrow \gamma$ transition in iron were determined by a method which depends on the constancy of the products of the rates of heating and the times of transformation, and a knowledge of the specific heats. (P12q, N6p; Ti, Fe)

19-P. Specific Heat of the Superconducting State. G. V. Chester. *Physical Review*, v. 104, ser. 2, Nov. 15, 1956, p. 883-885.

Shows that for tin, the lattice specific heat of the normal state is also present in the superconducting state. (P12r, P15g; Sn)

20-P. Resonance and Reversal Phenomena in Ferromagnetic Films. R. L. Conger and F. C. Essig. *Physical Review*, v. 104, ser. 2, Nov. 15, 1956, p. 915-923.

Experiments on evaporated films of three different alloy compositions demonstrate a predicted proportionality of the reversal time and the resonance line width.
(P16e; AY, 14-12)

21-P. Thermoelectric Power of Gray Tin. A. N. Goland and A. W. Ewald. *Physical Review*, v. 104, ser, 2, Nov. 15, 1956, p. 948-953.

The measured power of *p*-type samples is analyzed into electronic

and phonon contributions with Hall and electrical conductivity data. (P15h; Sn)

22-P. Residual Resistivity vs. Short-Range Order in Cu_3Au. A. C. Damask. *Physics and Chemistry of Solids,* v. 1, Sept.-Oct. 1956, p. 23-26.

Resistivity increases with increasing short-range order. (P15g, M26p; Cu, Au)

23-P. The Effect of Short-Range Order on Residual Resistivity. John B. Gibson. *Physics and Chemistry of Solids,* v. 1, Sept.-Oct. 1956, p. 27-34.

A general theory, based on the Nordheim approximation, for residual resistivity of binary solid solutions with short but no long-range order. Application to Cu_3Au and α brass. (P15g, M26p; Au, Cu)

24-P. The Electronic Properties of Nickel-Palladium Alloys. E. P. Wohlfarth. *Physics and Chemistry of Solids,* v. 1, Sept.-Oct. 1956, p. 35-38.

Available magnetic data analyzed. A series of further experimental investigations is suggested. (P15, P16; Ni, Pd)

25-P. Preliminary Electrical-Resistivity Measurements of the Nickel-Palladium Alloy System. A. I. Schindler, R. J. Smith and E. I. Salkovitz. *Physics and Chemistry of Solids,* v. 1, Sept.-Oct. 1956, p. 39-41.

Resistivity reaches a maximum at approximately 70 at. % palladium at 4.2, 77, and 300° K. Shift of the maximum from the 50-50 composition appears to be due to an *s-d* scattering component which increases with palladium content and persists down to liquid-helium temperatures. (P15g; Ni, Pd)

26-P. The Hall Effect in the Silver-Palladium Alloy System. A. L. Schindler. *Physics and Chemistry of Solids,* v. 1, Sept.-Oct. 1956, p. 42-44.

The effective number of conduction electrons calculated using a one-band model is compared with that obtained for the copper-nickel alloy system and a similarity in behavior is found. (P15; Ag, Pd)

27-P. Resistance and Paramagnetism at the Superconducting Transition. James C. Thompson. *Physics and Chemistry of Solids,* v. 1, Sept. Oct. 1956, p. 61-64.

Experiments on the longitudinal magnetization and resistance of indium rods at the superconducting transition under equilibrium conditions of large current, small magnetic field and constant temperature. (P15g, P16; In)

28-P. (English.) **Some Aspects of the Connection Between the Structure and Activities of Components in Molten Salt Mixtures.** Hakon Flood. *Svensk Kemisk Tidskrift,* v. 68, no. 10, 1956, p. 509-520.

Formulas expressing activity, application to the activity of ferrous oxide in openhearth slags and to liquidus curves in alkali halide phase diagrams, complex formation in salt melts. (P12b; GG-p, NO-a32)

29-P. (French.) **Influence of a Magnetic Field on the Electrical Resistance of Thin Nickel Plates.** Thérese Rappeneau. *Comptes Rendus,* v. 243, no. 19, Nov. 5, 1956, p. 1403-1406.

At room temperature, the electric resistance of thin evaporated nickel plates, under the influence of a magnetic field, decreases or increases according to the orientation of current-magnetization. In strong fields, the resistance decreases a little in both cases. (P15g, P16; Ni, 14-12)

30-P. (German.) **Texture and Magnetization Curve in Ferrosilicon.** Dieter Ganz and Robert Brenner. *Zeitschrift für Angewandte Physik,* v. 8, no. 10, Oct. 1956, p. 502-505.

An explanation of the difference between the magnetization curves obtained from large masses of ferrosilicon and the single crystal curves. (P16; AD-n31)

31-P. (Russian.) **Using Motion Pictures to Study the Dynamics of Domain Structure in the Crystals of Transformer Steel.** L. V. Kirenskii and V. D. Dylgerov. *Fizika Metallov i Metallovedenie,* v. 3, no. 2, 1956, p. 216-221.

A method of observing directly the qualitative and quantitative dynamics of domain structure as a function of field changes. (P16c, M27g, X5; AY)

32-P. (Russian.) **The Relationship Between the Magnetic Inductance of Hot Rolled Transformer Steel in Strong Field and the Thickness of the Sheets.** B. F. Trakhtenberg. *Fizika Metallov i Metallovedenie,* v. 3, no. 2, 1956, p. 222-228.

Reducing the thickness of polycrystalline ferromagnetic material reduces the value of the magnetic induction. (P16r; AY, 4-3)

33-P. (Russian.) **Magnetic Properties of Chromium Steel SH X 15 After Different Heat Treatments.** M. N. Mikheev, I. A. Kuznetsov, V. A. Kriukova and B. M. Neizvestnov. *Fizika Metallov i Metallovedenie,* v. 3, no. 2, 1956, p. 229-237.

Effects of temperature of tempering and annealing on the magnetic,

electrical and mechanical properties of the steel makes it possible to determine the mechanical properties by magnetic tests.
(P16, P15, Q general, J23, J29, 2-11; AY)

34-P. (Russian.) **The Effects of Impurities on the Electrical Properties of Lead Telluride.** T. L. Kovalchik and Iu. P. Maslakovets. *Zhurnal Tekhnicheskoi Fiziki,* v. 26, no. 11, Nov. 1956, p. 2417-2431.

Effects of various impurities on conduction of this semi-conductor. A significant increase in the concentration of free electrons is possible only by adding a double impurity, for example bromine and lead. Relation between temperature of heat treatment and the concentration of carriers. (P15g, 3-19; Pb, Te)

35-P. (Book.) **Nuclear Metallurgy.** v. III. George H. Vineyard, Donald E. Thomas, and Douglas S. Billington. 54 p. 1956. American Institute of Mining, Metallurgical, and Petroleum Engineers, 29 W. 39th Street, New York 18, N. Y.

Three papers dealing with theory and mechanism of radiation effects in metals; irradiation effects on physical metallurgical processes; and irradiation effects in reactor materials. (P18, T11, 2-15)

36-P. Magnets: There's Untapped Strength in Pure Iron Powder. F. E. Jaumot, Jr., and A. E. Berkowitz. *Iron Age,* v. 178, Dec. 20, 1956, p. 88-89.

Theoretical considerations indicate compacted iron powder will make stronger field and lighter weight magnet.
(P17, H general; SGA-n, Fe)

37-P. (Japanese.) **What Is a Permanent Magnet?** Yuki Shirakawa. *Metals,* v. 26, Dec. 1956, p. 906-910.

Characteristics of magnets; methods of expressing the characteristics of magnets; methods of enlarging the coercive force; effect of cooling in magnetic fields. Lists of JIS (Japan Industry Standards) on permanent magnets. 7 ref.
(P16; SGA-n, 15-11)

38-P. (Japanese.) **Progress in Modern Permanent Magnets.** Yuji Tachikawa. *Metals,* v. 26, Dec. 1956, p. 911-917.

Fundamental concepts of permanent magnets; experimental methods. Theory of coercive force (strain theory, magnetization fluctuation theory, fine particle theory). Results of research on several permanent magnets alloys and steels and fine particle magnets. 47 ref.
(P16; SGA-n)

39-P. Soft Magnetic Materials. *Electrical Manufacturing,* Jan. 1957, p. 66, 312-314.

Aluminum-iron alloys, vanadium-iron-cobalt alloy and irradiated materials are evaluated. (P16; SGA-n)

40-P. The Behaviour of Molybdenum on Cathodic Polarisation With Reference to the Effect of Anions on Its Hydrogen Overpotential. H. Khalifa and I. M. Issa. *Indian Chemical Society, Journal,* v. 33, Sept. 1956, p. 635-640. (CMA)

The behavior of molybdenum on cathodic polarization was compared with that of chromium to see if the anions influenced the Tafel-line slopes; therefore, the hydrogen overvoltage was studied using solutions of pure HCl, pure NaOH and mixtures of each of these with alkali phthalate, borate, phosphate and nitrate. Anions greatly influence the Tafel-line slopes when molybdenum is cathodically polarized, except for phosphate ions in acid solution.
(P15; Mo)

41-P. Enthalpy and Specific Heat . . Critical Survey of Methods of Determination for Iron and Steel. J. R. Pattison. *Iron and Steel,* v. 29, Dec. 8, 1956, p. 595-599.

Measurements of enthalpy and specific heat of a metal in the solid or liquid state; calculation of latent heat. Specific heat and enthalpy of iron. (P12r, 1-4; Fe)

42-P. Enthalpy of a 0.12% Carbon Steel. J. R. Pattison. *Iron and Steel,* v. 29, Dec. 8, 1956, p. 600-601.

Thermal analysis of the steel at the temperatures of allotropic points.
(P12r; CN)

43-P. Enthalpy of Pure Iron. J. R. Pattison. *Iron and Steel,* v. 29, Dec. 8, 1956, p. 601-605.

Calorimetric method and its apparatus for enthalpy measurement.
(P12r, 1-3; Fe)

44-P. Solubility and Diffusivity of Gold, Iron and Copper in Silicon. J. D. Struthers. *Journal of Applied Physics,* v. 27, Dec. 1956, p. 1560.

Solubility and diffusion constants determined by using radioactive isotopes. (P12e, N1; Si, *Au, Fe, Cu*)

45-P. Thermal Expansion Coefficients for Uranium Boride and Beta Uranium Silicide. Gunvor Beckman and Roland Kiessling. *Nature,* v. 178, Dec. 15, 1956, p. 1341.

Determination by X-ray powder methods and a high-temperature camera, mean values for the expansion coefficients between room temperature and 205° C. for different directions in the lattice are summarized. (P11g, M26r; U)

46-P. Differential Elastic Scattering of 14 MeV Neutrons in Lead, Mercury and Zinc. H. Nauta. *Nuclear Physics,* v. 2, Oct. 1956, p. 124-131.

Differential cross sections for the elastic scattering of 14 MeV neutrons from lead, mercury and zinc have been measured in a ring geometry using a biased detection with a spherical liquid scintillator. 9 ref. (P18j; Pb, Hg, Zn)

47-P. Resistivity Changes in Ag-Pd Alloys. W. H. Aarts and A. S. Houston McMillan. *South African Journal of Science,* v. 53, Nov. 1956, p. 88.

In measurements carried out on palladium and silver alloys it was found that the 50 at.% alloys behaved normally but that the 75% Ag, 25% Pd alloy, when plastically deformed, also showed a decrease in resistivity. (P15g; AG, Pd)

48-P. Reactions of Cerium and Lanthanum With Ceramic Oxides. G. R. Pulliam and E. S. Fitzsimmons. *U. S. Atomic Energy Commission. ISC*-659, July 1955, 59pp. (CMA)

The surface properties of cerium and lanthanum melted on refractory oxide plaques were studied by the sessile drop method and included surface tension, contact angles, work of adhesion and interfacial reactions. Data on the latter were obtained by metallographic and X-ray methods. Of the refractories studied (alumina, beryllia, thoria and zirconia), beryllia was best from a diffusion and interfacial reaction viewpoint but zirconia is considered feasible. 22 ref.
(P13h; RM-h, Ce, La)

49-P. (English.) **Scattering of Slow Mu-Mesons in Copper.** A. I. Alikhanian and V. G. Kirillov-Ogriumov. *Academy of Sciences of the U. S. S. R. Physical Series. (Columbia Technical Translations),* v. 19, no. 6, p. 667-675.

In the momentum interval from 80 to 139 Mev/c there is an excess of cases of mu-meson scattering to angles with a projection greater than 15°. (P18n; Cu)

50-P. (English.) **Thermal Expansion Coefficient, Rigidity Modulus and Its Temperature Coefficient of the Alloys of Iron, Nickel, Cobalt and Chromium, and Relations of Super Invar to Stainless Invar and of Elinvar to Co-Elinvar.** Hakaru Masumoto, Hideo Saito, Tatsuo Kono and Yutaka Sugai. *Science Reports of the Research Institutes, Tohoku University,* v. 8, Dec. 1956, p. 471-483.

Influence of an addition of chromium on the thermal expansion, rigidity modulus and its temperature coefficient of the alloys of iron, nickel and cobalt.
(P11g, 2-10; Fe, Ni, SGA-s)

51-P. (English.) **Thermodynamic Activities in Iron-Cobalt Solid Solutions.** Tsuneo Satow, Sukeji Kachi and Keizo Iwase. *Science Reports of the Research Institutes, Tohoku University,* v. 8, Dec. 1956, p. 502-510.

Procedure, errors and results of the experiments concerning alpha and gamma phase, superlattice formations of entropies and heat of formation.
(P12q, P12s, N10a; Fe, Co)

52-P. (English.) **Effects of Additionals on the Magnetic Properties of $PbO-Fe_2O_3$ System.** Hiroshi Kojima. *Science Reports of the Research Institutes, Tohoku University,* v. 8, Dec. 1956, p. 540-546.

Experimental results of sintering temperature; effects of Fe_2O_3/PbO; effects of ZnO, CdO, SnO, MgO, NiO, CuO and CoO, Cr_2O_3, B_2O_3, GeU_2, SrO_2 and ZrO_2. Some effective additionals were found.
(P16, 2-10; Pb, Fe)

53-P. (German.) **Electron Emission in the Case of Oxidation of Mechanically Polished Metal Surfaces.** J. Lohff. *Zeitschrift fur Physik,* v. 146, Oct. 1946, p. 436-446.

A series of chemically active metals emits streams of electrons after surface treatment with a steel brush, whose intensity is chiefly dependent on oxygen, not hydrogen, in the container. These intensities decrease at higher temperatures, the emissions increase to a maximum with time and then decrease. Results are contrary to the "Haftstellen Theory" in nonmetals.
(P17d, L10e)

54-P. (Russian.) **Absolute Dynamic Method of Determining the True Specific Heat of Metals.** A. I. Lazarev, *Sb. rabot Leningr. in-ta tochnoy mechaniki i optiki,* No. 12, 1954, p. 32-45. From *Referativnyy Zhurnal Fizika,* No. 9, Sept. 1956, Abstract No. 25291.

Two new methods were devised for determining the specific heat of

metals in the solid and liquid state. The metallic specimens are put into a massive metallic block and thermally isolated from the block and from each other. One of the specimens is supplied with a heater. The block is heated in a furnace and the power supplied to one specimen and the difference in temperatures between the block and the specimens and the temperature of the block are measured. In the absolute method both specimens are identical while in the comparative method, one of the specimens is made of standard metal, but the shape, surface and size of the specimens are identical. (P12r, 1-4)

55-P. Free Energy of Formation of Mn_7C_3 From Vapor Pressure Measurements. C. Law McCabe and R. G. Hudson. *Journal of Metals,* v. 9, Jan. 1957, p. 17-19.

Pressure measurements by the Knudsen cell method to determine the free energy of formation of manganese carbide in the temperature range 800° to 950° C. 7 ref. (P12a, 1-4; Mn, 14-18)

56-P. Thermodynamics of Slag Systems. Part I—The Thermodynamic Properties of $CaO-Al_2O_3$ Slags: Part II—The Thermodynamic Properties of $CaO-SiO_2$ Slags. P. T. Carter and T. G. Macfarlane. *Journal of the Iron and Steel Institute,* v. 185, Jan. 1957, p. 54-66.

Study of the equilibrium between $CO-CO_2-SO_2$ gas mixtures and CAO-Al_2O_3, and between $CO-CO_2-SO_2$ and $CaO-SiO_2$ slags at 1500° C. and determinations of heats and free energies of formation. 49 ref. (P12q, P12a; RM-q)

57-P. (German.) **Thermodynamic Analysis VIII. Calorimetry and Thermodynamics of Indium-Zinc Alloys.** Willy Oelsen and Peter Zühlke. *Archiv für das Eisenhüttenwesen,* v. 27, Dec. 1956, p. 743-752.

Indium-zinc alloys mix completely in the melt but are nearly immiscible in the solid state. The solidification curves show deviations from the law of freezing point depression for low zinc contents. A thermodynamic analysis of these alloys is carried out. 13 ref. (P12; In, Zn)

58-P. (German.) **Temperature Dependence of Susceptibility of Iron-Chromium Alloys.** Werner Köster and Albrecht von Kienlin. *Archiv für das Eisenhüttenwesen,* v. 27, Dec. 1956, p. 787-792.

The dependence of the susceptibility on the field strength at different temperatures is determined for two commercial iron-chromium alloys having 17.9 and 24.7% Cr and one very pure alloy with 26.4% Cr. The resulting permeability-temperature curves are discussed. 18 ref. (P16q, 2-11; Fe, *Cr*)

59-P. (German.) **Mean Specific Heats of Cemented Carbides Between Room Temperatures and −190° C.** H. J. Boosz. *Metall,* v. 11, Jan. 1957, p. 22-23.

Specific heats were measured by means of an evaporation calorimeter. Molecular heat of tungsten carbide is estimated at 6.85 cal/mol. 9 ref. (P12r; W, 6-19)

60-P. (Russian.) **Heats of Formation of Titanium Silicides.** Yu. M. Golutvin. *Zhurnal Fizicheskoi Khimii,* v. 30, no. 10, Oct. 1956, p. 2251-2259. (CMA)

Combustion heats of the three known titanium silicides, $TiSi_2$, TiSi and Ti_5Si_3, as well as of titanium and silicon, were measured by burning in a quartz cup placed in a bomb. From the data obtained the following values of standard heats of formation were computed: $TiSi_2$, −42.9 −4.5 kcal/mol; TiSi, −39.2 −3.0 kcal/mol; Ti_5Si_3, −147 −12 kcal/mol. 17 ref. (P12q, 1-4; Ti, 14-18)

61-P. Interface Energy Studies of Some Copper-Tin Alloys Containing a Liquid Phase. A. A. Krishnan and B. Halder. *Journal of Scientific and Industrial Research,* v. 15B, Dec. 1956, p. 676-681.

The influence of successive additions of tin to copper on the dihedral angle of alpha bronze vs. liquid phases; the effect of temperature on the dihedral angle and on the relative interface energy. (P13h, 2-11; Cu, *Sn*)

62-P. Heat Capacity of Tungsten Between 4 and 15° K. T. R. Waite, R. S. Graig and W. E. Wallace. *Physical Review,* v. 104, Dec. 1, 1956, p. 1240-1241.

Equation of heat capacity represented with an average deviation of about 1%. The electronic specific heat and Debye temperature evaluated. (P12r; W)

63-P. Conduction Band Structures of Germanium-Silicon Alloys. Maurice Glicksman and Schuyler M. Christian. *Physical Review,* v. 104, Dec. 1, 1956, p. 1278-1279.

Galvanomagnetic measurements in terms of a specific model for conduction band structures. (P15g; Ge, Si)

64-P. Magnetization Reversal in Thin Film. Donald O. Smith. *Physical Review,* v. 104, Dec. 1, 1956, p. 1280-1281.

Magnetization reversal of 80-20 Permalloy in a strip transmission line. (P16; Ni, SGA-n)

65-P. Slow-Neutron Resonance Scattering in Ag, Au, and Ta. R. E. Wood. *Physical Review,* v. 104, Dec. 1, 1956, p. 1425-1433.

Scattering cross-section analysis by the "bright-line" technique. (P18m; Ag, Au, Ta)

66-P. The Temperature Dependence of the Electrical Resistivity of the β-Phase Titanium-Molybdenum Alloys. S. Yoshida and Y. Tsuya. *Physical Society of Japan, Journal,* v. 11, Nov. 1956, p. 1206-1207. (CMA)

Five Ti-Mo alloys (12%, 14%, 17%, 25%, and 30% Mo) were studied for electrical resistivity vs. temperature. The anomalous behavior of the curves resembles that of alloys used for electrical resistance use, but temperature hysteresis and aging effects are lacking. The electronic structure is probably the cause of this resemblance. 3 ref. (P15g, 2-11; Ti, *Mo*)

67-P. Effects of Radiation on Materials. Michael Ference. *Society of Automotive Engineers, Preprint,* Jan. 1957, 10 p.

Attenuation of radiation, basic mechanism of radiation damage and its effects on materials; radiation as a source of energy for chemical reactions, vulcanization of rubber. 14 ref. (A8c; 2-17, 6-12)

68-P. The Theory of Cyclotron Resonance in Metals. M. A. Azbel and E. A. Kaner. *Soviet Physics, JETP,* v. 3, Dec. 1956, p. 772-774.

New form of resonance in metals which differs from diamagnetic resonance; conditions for cyclotron resonance. 6 ref. (P18m)

69-P. Inelastic Scattering Parameters of Zirconium. E. F. Clancy. *U.S. Atomic Energy Commission, KAPL-M-EFC-3,* Nov. 26, 1956, 7 p. (CMA)

Previously outlined procedures used for iron were utilized to determine the inelastic cross section parameters of zirconium. Angular distributions were assumed to be isotropic. (P18j; Zr)

70-P. The Heat Content and Specific Heat of Zirconium-Tin Alloy. R. B. Holden and B. Kopelman. *U.S. Atomic Energy Commission, SEP-128,* 1953, 17 p. (CMA)

The heat content and specific heat of 5% Sn zirconium were determined by drop calorimeter; the respective ranges were 25 to 1500° C. and 100 to 900° C. Accuracies are discussed. (P12r; Zr, *Sn*)

71-P. (English.) **On the Magnetic Properties of the System MnSb-CrSb.** Tokutaro Hirone, Seijiro Maeda, Ichiro Tsubokana and Noburu Tsuya. *Physical Society of Japan, Journal,* v. 11, Oct. 1956, p. 1083-1087.

Change of magnetic properties due to the replacement of manganese in manganese antimonide. 7 ref. (P16; SGA-n, Mn, Sb, Cr)

72-P. (French.) **The Electrical Conductivity of the Cerium-Hydrogen System.** Joseph Daou and Rodolphe Viallard. *Académie des Sciences, Comptes Rendus des Séances,* v. 243, Dec. 17, 1956, p. 2050-2052. (CMA)

Observations on the cerium-hydrogen system showed that hydrogen is absorbed by cerium at ambient temperatures, causing a measurable increase in the electric resistance. At first the resistance follows the same sigmoid course as the absorption, but as the reaction slows down the resistance decreases, though remaining higher than the original metallic resistance. The decrease in resistance may be due to a contact modification between the microcrystals of the metal hydride or, more likely, may be connected with the evolution of the reticular organization of the system during hydrogenation. 5 ref. (P15g, N15e; Ce, *H*)

73-P. (German.) **Structure and Magnetic Properties of Permanent Magnet Alloy During Isothermal Segregation Hardening. II.** E. Biedermann and E. Kueller. *Zeitschrift für Metallkunde,* v. 47, Dec. 1956, p. 760-774.

The course of saturation magnetization, residual magnetism, the constant of magnetic viscosity, electrical conductivity and mechanical hardness have been measured as a function of aging time during isothermal hardening of some copper-nickel-iron alloys. Principles for the magnetic behavior of a substance consisting of fine ferromagnetic particles in a nonmagnetic matrix. The course of various magnetic properties during isothermal hardening. 27 ref. (P16, J27d; SGA-n)

74-P. (Russian.) **Some Results of an Investigation of the Isotopic Shift in the Spectrum of Neodymium.** F. A. Korolev and Yu. I. Osipov. *Doklady Akademii Nauk SSSR,* v. 110, 1956, p. 365-367.

The isotopic shift was studied by using a natural neodymium isotope mixture in the region of 4450 to 6500 A. The optical system consisted of a spectrograph ISP-51 with a camera UF-84 and interferometer of GOI (State Optical Institute) construction. The obtained spectrograms were measured by a comparator IZA-2 and some lines photomeasured by a photoelectric recorder MF-4. (P17e, 1-2; Nd, 14-13)

75-P. (Russian.) **The Effect of Admixtures on the Electrical Properties of Lead Telluride.** T. L. Koval'chik and Yu. P. Maslakovets. *Zhurnal Tekhnicheskoy Fiziki,* v. 26, Nov. 1956, p. 2417-2431.

Effect of various admixtures on the type of conductivity exhibited by lead telluride which is considered to be a typical instance of a biocomponent substance. An attempt has been made to define the conditions under which one may expect the appearance of p- and n- conductivity, as has been done in the case of the nonocomponent substances germanium and silicon. (P15g; Pb, Te, 14-18)

76-P. (Russian.) **Concerning Some Possibilities of Measuring the Intensity of Hall EMF Film Transducers Made of HgSe, HgTe, or Their Solid Solutions.** O. D. Yelpat'yevskaya and A. R. Regel'. *Zhurnal Tekhnicheskoy Fiziki,* v. 26, Nov. 1956, p. 2432-2438.

Mercuric selenide and mercuric selenide-mercuric telluride are suitable materials for film transducers to measure the Hall electromotive force which indicates the intensity of the magnetic field. The sensitivity of these transducers approaches that of germanium and indium antimonide. (P15p; Hg, Se, Te)

77-P. (Russian.) **The Diffusion of Lead in Lead Telluride.** B. I. Boltaks and Yu. N. Mokhov. *Zhurnal Tekhnicheskoy Fiziki,* v. 26, Nov. 1956, p. 2448-2450.

Preliminary experiments demonstrated that introduction of lead into lead telluride changes the conductivity of the latter from the hole type to the electron type. The method of electron-hole transitions was used to measure the diffusion of lead into lead telluride. Further research on the diffusion of admixtures into lead telluride is planned with the view of studying the semiconductor properties of lead telluride as affected by these admixtures. (P15g, N1; Pb, Te, 14-18)

78-P. (Russian.) **Concerning the Problem of the Effective Mass of Electrons and Holes in Germanium.** Z. Kopata. *Zhurnal Tekhnicheskoy Fiziki,* v. 26, Nov. 1956, p. 2451-2458.

The authors subject to theoretical investigation the structure of the conductivity zone of germanium by considering the temperature dependence of the thermo-electromotive force and the concentration of current carriers in the region of admixture conductivity. (P15g; Ge)

79-P. (Russian.) **Concerning the Measurement of the Velocity of Surface Recombination in Thin Semiconductor Samples With Qualitatively Different Faces.** O. V. Sorokin. *Zhurnal Tekhnicheskoy Fiziki,* Nov. 1956, p. 2467-2472.

Investigation of the effects of ion and electron bombardment on the velocity of surface recombination in germanium and study of the action of external electric fields and of some chemical substances applied to the surface of germanium samples. (P15; Ge)

80-P. (Russian.) **Concerning the Valve Properties of Silver Selenide and Silver Telluride.** N. G. Klyuchnikov. *Zhurnal Tekhnicheskoy Fiziki,* v. 26, Nov. 1956, p. 2603.

To endow silver selenide and silver telluride plates with valve properties, these plates were firmly compressed between plates of magnesium and copper. A direct current applied on the reversed direction, with the magnesium plate serving as the cathode, was then passed through the silver compound plates. Formation of the barrier layer took place as a result of reduction with magnesium and consequent formation of a thin silver layer. The valves obtained in this manner have interesting potential-current characteristics and a high ratio between the forward and the reverse currents. However, they cannot be used as rectifiers of alternating current, because the initial conditioning disappears when current in the forward direction is passed. The conditioning is also lost on storage. (P15; Ag, Se, Te, 14-18)

81-P. **Properties of Galium Indium Antimonide.** J. S. Blakemore. *Canadi-*

an Journal of Physics, v. 35, Jan. 1957, p. 91-97.

Electrical conductivity and photoconductivity, optical absorption and Hall effect for p-type specimens of polycrystalline material. (P15; Ga, In)

82-P. Surface Finish and Attenuation of Aluminum Waveguides. J. Allison and F. A. Benson. *Electronic Engineering,* v. 29, Jan. 1957, p. 36-38.

Calculation of attenuation in wave length. (P15; Al)

83-P. Metal-Oxide Solid Solutions. Part II. Activity Relationships in Solid Solutions of Ferrous Oxide and Manganous Oxide. P. K. Foster and A. J. E. Welch. *Faraday Society, Transactions,* v. 52, Dec. 1956, p. 1636-1642.

Determination of equilibrium oxygen pressures at 850, 1000 and 1150° C. for reduction of solid solutions of ferrous oxide (wustite) and manganous oxide to metal. 6 ref. (P12b; Fe, Mn, 14-17)

84-P. The Electrochemical Polarization of Silver Single Crystals in Cl. Part I. Structural Changes of (100) and (111) Faces Under Cathodic Conditions. M. Fleischman, J. Sowerby and H. R. Thirsk. *Faraday Society, Transactions,* v. 53, Jan. 1957, p. 91-100.

Investigation of the cathodic treatment at constant potential of (100) and (111) faces of silver prior to silver chloride formation. 24 ref. (P15, M26n; Ag)

85-P. Optical Properties and Oxidation of Evaporated Titanium Films. G. Hass and A. P. Bradford. *Optical Society of America, Journal,* v. 47, Feb. 1957, p. 125-129. (CMA)

Reflectances, transmittances and optical constants were measured for titanium films evaporated onto quartz and glass at low pressures. Films 100-300 Å thick had uniform transmittance through the visible spectrum and may be used as neutral density filters. The oxidation of titanium in air was measured by three optical principles; the oxidation rate equals that of aluminum at 25° C. but soon exceeds it. 9 ref. (P17, R1h; Ti, 14-12)

86-P. Effect of Monolayer Adsorption on the Ejection of Electrons From Metals by Ions. Homer D. Hagstrum. *Physical Review,* v. 104, Dec. 15, 1956, p. 1516-1527.

Effect of monolayer adsorption on total electron yield and on electron energy distribution; anomalous behavior of tungsten in the presence of hydrogen. (P15; W)

87-P. Electrical Properties of n-Type InAs. T. C. Harman, H. L. Goering and A. C. Beer. *Physical Review,* v. 104, Dec. 15, 1956, p. 1562-1564.

Measurement of Hall coefficient and resistivity as a function of temperature on uncompensated indium arsenide. 13 ref. (P15; In, As, 14-18)

88-P. Magnetic Susceptibility of Dilute Cu Alloys at Low Temperature. F. T. Hedgecock. *Physical Review,* v. 104, Dec. 15, 1956, p. 1564-1567.

Temperature dependence of the magnetic susceptibility of dilute copper-tin and copper-iron alloys measured between room temperature and 4.2° K. 13 ref. (P16, 2-13; Cu, *Sn, Fe*)

89-P. Magneto-Band Effects in InAs and InSb in DC and High Pulsed Magnetic Fields. S. Zwerdling, R. J. Keyes, S. Foner, H. H. Kohn and Benjamin Lax. *Physical Review,* v. 104, Dec. 15, 1956, p. 1805-1807.

In a magnetic field semiconductors and semimetals with small effective mass have quantized Landau level whose energy separations can become comparable to the energy gap or overlap of the bands. (P15; In, As, Sb)

90-P. Thermal Equilibrium in Nuclear Magnetic Cooling of Metals. C. Kittel. *Physical Review,* v. 104, Dec. 15, 1956, p. 1807-1808.

Study of the rate at which the conduction electrons come into thermal equilibrium with the nuclear spins at 20 micro degrees. (P18)

91-P. Specific Heats of Liquid Metals and Liquid Salts. T. E. Douglas. *Transactions of the ASME,* v. 79, Jan. 1957, p. 23-28.

Known data on specific heats examined on a volume basis; predicting of specific heats in cases for which no data exist is proposed. 9 ref. (P12r; 14-10)

92-P. (Finnish.) **The Equilibrium State of the System Ilmenite-HCl(aq)-$TiCl_4$-$FeCl_2$-TiO_2 (Amorph).** S. Wilska. *Suomen Kemistilehti,* v. 29, no. 11B, 1956, p. 195-199. (CMA)

Ilmenite solubility in HCl was studied; the equilibrium constant for the over-all dissolution reaction was determined such that $K_c = 2.41$. Thermodynamic values were also determined. The initial rate of solution of titanium was definitely higher in concentrated HCl, due to hexachlorocomplex formation. The dissolution process proceeds as $FeO.TiO_2 + 6HCl(aq) \rightleftharpoons FeCl_2(HCl, aq) + TiCl_4(HCl, aq) + 3H_2O$. 6 ref. (P12e; Ti)

93-P. (French.) **Electronic and Ionic Properties of Transition Metals.** Andre Roos. *Chimie et Industrie,* v. 76, Nov. 1956, p. 1032-1046.

Electronic theory of metals: ionization, ferromagnetic phenomena, magnetostriction, lattice-distortion theory, magnetic transformation temperature, atomic and ionic diffusion and magnetic aging. Describes experimental study of anodic oxidation making it possible to measure the "ionic diffusion coefficient" of metals by a new method, based on the continuous measure of the thickness of oxide film by means of a photoelectric cell. (P15, P16)

94-P. (French.) **Study of the Ternary Alloys Palladium-Nickel-Copper.** Joseph Cohen. *Comptes Rendus,* v. 245, Dec. 5, 1956, p. 1845-1847.

Magnetic transformation temperature and magnetic properties of palladium-nickel-copper. 5 ref. (P16; Pd, Ni, Cu)

95-P. X-Ray and Magnetic Study of Nickel Selenides in the Range NiSe to $NiSe_2$. Fredrich Gronvold and Einar Jacobsen. *Acta Chemica Scandinavia,* v. 10, no. 9, 1956, p. 1440-1454.

Two nickel selenide phases are identified in the range of NiSe to $NiSe_2$ by means of X-rays. Results of X-ray study, density measurements and magnetic properties. 32 ref. (P16; Ni, *Se*)

96-P. Use of Sodium and Sodium-Potassium Alloy as a Heat-Transfer Medium. W. B. Hall and T. I. M. Crofts. *Institute of Mechanical Engineers, Proceedings,* v. 170, no. 10, 1956, p. 321-339.

The applications of liquid metals in heat-transfer problems. Comparisons are drawn between those metals whose melting points are sufficiently low to make them of interest in this respect. Design and construction of liquid metal circuits and the components which are commonly used in them are given. 13 ref. (P11k; SGA-d, 14-10)

97-P. Electrical Resistance of Thin Metal Films Before and After Artificial Aging by Heating. Richard B. Belser. *Journal of Applied Physics,* v. 28, Jan. 1957, p. 109-116.

Measurement of electrical resistances of thin films of 24 metals, deposited on glass substrates (near room temperature) by evaporation, sputtering or electroplating before and after artificial aging by heating in vacuo. (P15g, 2-15; 14-12)

98-P. Interface Energy Studies of Some Copper-Tin Alloys Containing a Liquid Phase. A. A. Krishnan and B. Halder. *Journal of Scientific and Industrial Research,* v. 15B, Dec. 1956, p. 676-681.

The influence of successive additions of tin to copper on the dihedral angle of alpha bronze vs. liquid phase like lead and bismuth. The effect of temperature on the dihedral angle and hence on the relative interface energies is reported. 4 ref. (P13h, 1-11; Cu, Sn)

99-P. Metals That Flow. Sanford C. Cohen. *Northwestern Engineer,* v. 16, Feb. 1957, p. 30-31, 52.

The unusual properties of liquid metals offer solutions to some of the more difficult heat transfer problems. (P12k; 14-10)

100-P. An Analysis of Magnetization Processes in Iron Single Crystals by an Electrical Method. R. Parker. *Philosophical Magazine,* v. 1, 8th series, Dec. 1956, p. 1133-1146.

Doring's theory of anisotropy of electrical resistivity of ferromagnetics is applied to published magnetoresistance data of single crystals of iron. The five anisotropy coefficients for iron are evaluated. (P16, P15g; Fe, 14-11)

101-P. Ferromagnetic Resonance in Metal Single Crystals. J. O. Artman. *Physical Review,* v. 105, Jan. 1, 1957, p. 74-84.

Microwave susceptibility expressions for ferromagnetic resonance for metal single crystals possessing crystalline anisotropy. Crystals of uniaxial and cubic magnetic symmetry are considered. (P16; 14-11)

102-P. Structure of the Intermediate State in Superconducting Lead. P. B. Alers. *Physical Review,* v. 105, Jan. 1, 1957, p. 104-108.

The Faraday effect in a cerous nitrate-glycerol mixture was used to study the structure of the intermediate state. Photographs showing the distribution of normal and superconducting material at various magnetic fields. A lead alloy containing antimony and tin was used as a specimen. (P15g, P16; Pb)

103-P. Thermal Expansion of Rare Earth Metals. F. Barson, S. Legvold and F. H. Spedding. *Physical Review,* v. 105, Jan. 15, 1957, p. 418-424. (CMA)

The thermal expansion of lanthanum, cerium, praseodymium, neo-

dymium, gadolinium, terbium, dysprosium, europium and ytterbium measured from 25 to 900° C. The first four show plastic flow properties below their melting points; praseodymium, neodymium and ytterbium have high-temperature phase transformations, gadolinium, terbium and dysprosium have negative coefficients of expansion, and that of ytterbium is three times those of the others. 29 ref. (P11g; EG-g)

104-P. Hall Effect and Resistance of Dilute Gold-Chromium Alloys at Low Temperatures. Werner B. Teutsch and William F. Lowe. *Physical Review,* v. 105, Jan. 15, 1957, p. 487-490.

The temperature dependence of the Hall effect and of the electrical resistance in pure gold and in gold containing 0.03 and 0.05 at.% chromium, principally at temperatures in the liquid helium region. For these compositions the temperature dependence of the resistance is abnormal at low temperatures, exhibiting a resistance minimum. (P15g, 2-13; Au, Cr)

105-P. Carrier Lifetime in Semiconductors for Transient Conditions. D. J. Sandiford. *Physical Review,* v. 105, Jan. 15, 1957, p. 524.

On the basis of the trap model the solution is given for the transient recombination of holes and electrons in semiconductors such as encountered in photoconductive decay experiments. (P18g)

106-P. Temperature Dependence of Piezoresistance of High-Purity Silicon and Germanium. F. J. Morin, T. H. Geballe and C. Herring. *Physical Review,* v. 105, Jan. 1957, p. 525-539.

The change of resistance in uniaxial compression has been measured for a number of single-crystal specimens of high-resistivity n and p-type germanium and silicon over the ranges 5° to 350° K. (germanium) and 20° to 350° K. (silicon). 16 ref. (P15g, 2-11; Si, Ge)

107-P. Neutron Transmission Measurements and Resonance Parameters in Cadmium. F. B. Simpson and R. G. Fluharty. *Physical Review,* v. 105, Jan. 15, 1957, p. 616-619.

Neutron transmission measurements for cadmium from 14.5 electron volts to 11 kilo-electron volts. Isotropic assignments have been made to those resonances which are due to cadmium^{111} and cadmium^{113} by using a sample enriched in cadmium^{111} and another sample depleted in cadmium^{113}. 12 ref. (P18m; Cd)

108-P. A Comparison of Magnetic Viscosity and Anisotropic High Coercivity Alloys. R. Street and J. C. Wooley. *Proceedings of the Physical Society,* v. 69B, Dec. 1, 1956, p. 1189-1199.

Measurements of magnetic viscosity in equiaxed isotropic and anisotropic Alcomax III specimens; the anisotropy was introduced by cooling the material from the single-phase region in a magnetic field of 4000 Oersteds. Results in terms of the concept of the thermal activations of irreversible domain boundary wall movements. 11 ref. (P16; SGA-n)

109-P. Magneto-Thermal Effects in Nickel and Cobalt. R. S. Tebble and R. W. Teale. *Physical Society, Proceedings, Section B,* v. 70, Jan. 1957, p. 51-64.

Comprehensive measurements on the reversible and total magnetothermal effect, the reversible susceptibility and the magnetization curves of annealed nickel and cobalt. 11 ref. (P16; Ni, Co)

110-P. Magneto-Resistance Effects in the Group I Metals at High Fields. R. G. Chambers. *Royal Society Proceedings, Series A,* v. 238, Jan. 8, 1957, p. 344-357.

Measurements on the resistivity and Hall coefficient of pure specimens of copper, silver and gold at 4° K. in fields up to 25KG. The theoretical form of the conductivity tensor in high fields is worked out for arbitrary dependence of energy and relaxation time on wave-vector and is found to be in qualitative disagreement with the experimental results. 24 ref. (P16, P15g; Cu, Ag, Au)

111-P. Thermal Conductivity of Germanium and Silicon Between 2 and 300° K. J. A. Carruthers, H. M. Rosenberg, T. H. Geballe and J. M. Ziman. *Royal Society Proceedings, Series A,* v. 238, Jan. 29, 1957, p. 502-514.

The thermal conductivity of single crystals of pure n-type germanium and of p-type germanium containing from 10^{14} to 10^{19} group 3 impurity atoms per cc. has been measured from 2° to 90° K. In some cases the readings have been extended to room temperature. 27 ref. (P11h; Ge, Si)

112-P. Environment Barrier Plagues Supersonic Electric Equipment. Victor

B. Hart. *Western Metals,* v. 15, Feb. 1957, p. 54-55.

Summarizes upper temperature limits for basic materials and electric components. (P15, 1-12, Ti)

113-P. The Dissociation Pressures of the Tantalum Silicides. Clifford E. Myers and Alan W. Searcy. *American Chemical Society, Journal,* v. 79, Feb. 5, 1957, p. 526-528.

The dissociation pressures of the tantalum silicides measured by Knudsen effusion method. Phase modifications in the temperature ranges covered were established by quenching experiments and X-ray diffraction investigation. (P12; Ta, Si)

114-P. Molybdenum Combats High Temperature. *Chemical Engineering,* v. 64, March 1957, p. 298, 300, 302, 304. (CMA)

Molybdenum is more advantageous to process engineers than are superalloys and ceramics, because of the variety of forms available. The modulus of elasticity, thermal conductivity, coefficient of thermal expansion, electrical conductivity, absorption cross section, hardness, creep-rupture and corrosion resistance are discussed. Molybdenum parts are available as spinnings, forgings and extrusions, or as drawn, machined, welded, brazed and riveted. Uses are described. (P general, Q general, 2-12, T general; Mo)

115-P. Supermendur—a New Rectangular-Loop Magnetic Material. H. L. B. Gould and D. H. Wenny. *Electrical Engineering,* v. 76, March 1957, p. 208-211. (CMA)

The magnetic and mechanical properties of a vanadium-iron-cobalt alloy discussed. Outstanding qualities are high remaneance and permeability and low hysteresis loss and coercive force. The hysteresis loop is rectangular. Melting, processing and heat treatment of the alloy described. The alloy should be very useful in power applications, miniaturization, telephone receivers, switches and refractory applications. (P16, A general, SGA-n)

116-P. Current Distribution in Galvanic Cells Involving Natural Convection. Carl Wagner. *Electrochemical Society, Journal,* v. 104, Jan. 1957, p. 129-131.

From equations for mass transfer due to natural convection in a laminar boundary layer, it is derived that, in electrolytic cells used for the refining of metals such as copper, the current density is virtually constant, although concentration polarization at both the cathode and the anode varies from bottom to top. 9 ref. (P15, C23p; Cu)

117-P. Influence of Impurities on the Photoconductance of Zinc Oxide. Harold A. Papazian, Paul A. Flinn and Dan Trivich. *Electrochemical Society, Journal,* v. 106, Feb. 1957, p. 84-92.

The photoconductance of pure zinc oxide and zinc oxide with known impurities, both in powder form, has been measured using a condenser method. When irradiated by light, zinc oxide undergoes a "memory mechanism" which depends on the past irradiation history. It is suggested that the memory is caused by the formation of traps independent of charge carrier formation. 23 ref. (P17c, 3-19; Zn, 14-18)

118-P. The Cohesive Energies of Transition Metals. J. Stanley Griffith. *Journal of Inorganic and Nuclear Chemistry,* v. 3, Aug. 1956, p. 15-23.

The cohesive energy is regarded as made up of just two parts, one arising from the breakdown of intra-atomic spin couplings and the other from the formation of interatomic ones. The former is calculated in terms of atomic spectral parameters and the latter is assumed to vary smoothly along the series with a maximum in middle. (P18)

119-P. Volume-Temperature Relationships in Magnesium Cadmium Alloys—I. Thermal Expansivities in the Order-Disorder Range. R. A. Flinn, W. E. Wallace and R. S. Craig. *Journal of Physical Chemistry,* v. 61, Feb. 1957, p. 234-236.

Thermal expansivities of magnesium chloride were measured to try to ascertain the factors responsible for the abundance of vacancies. The measurements were extended to the compositions MgCd and Mg_3Cd. There is good agreement between the present results and expansivities obtained by the X-ray method and volume expansivities computed from measured lines expansivities of bulk samples. (P10d, P12g; Mg, Cd)

120-P. Volume-Temperature Relationships in Magnesium-Cadmium Alloys—II. Kinetics of the Order-Disorder Transformation in $MgCl_3$. R. A. Flinn, W. E. Wallace and R. S. Craig. *Journal of Physical Chemistry,* v. 61, Feb. 1957, p. 236-239.

The rates of ordering and disordering of magnesium cadmide have been determined by a dilatometric method. The transformation appears to occur in two stages both of which are, within the limit of error, first order processes. Rate constants at a number of temperatures are presented. (P10d, N10a; Mg, Cd)

121-P. The Existence of Microcracks After Cold-Work. A. N. Stroh. *Philosophical Magazine,* v. 2, Series 8, Jan. 1957, p. 1-4.

It is suggested that changes in density and electrical resistance on cold work may be due to the formation of microcracks. To fit the experimental values of Clarebrough, et al., 8 x 10^4 cracks per square centimeter are needed, each 1.3 x 10^{-3} centimeters in length.
(P10a, P15g, Q26p, 3-18)

122-P. Magneto-Resistance in Metals. D. K. C. MacDonald. *Philosophical Magazine,* v. 2, Series 8, Jan. 1957, p. 97-104.

Magneto-resistance of sodium and rubidium. Measurements have been made both on plate-like specimens which show very strong anisotropy in the magnetic field, and on a cylinder of diameter large compared with the mean free path of the electrons. (P16; Na, Rb)

123-P. Ferromagnetic Resonance in Thin Films of Permalloy. P. E. Tannewald and M. H. Seavery. *Physical Review,* v. 105, Jan. 15, 1957, p. 337-378.

Microwave resonance measurements have been made in evaporated 82% Ni, 18% Fe films 760 to 1600 thick. The longest relaxation, as measured by the line width, gives relaxation time, T_2 = 3 x 10^{-3} sec. The sample thickness was equal to or less than the skin depth, resulting in a Lorentzian-type line. Multiple resonances were obtained according to shape anisotropy theory. (P16; Ni, Fe, SGA-n, 14-12)

124-P. Effects of Thick Oxides on Germanium Surface Properties. M. Lasser, C. Wysocki and B. Bernstein. *Physical Review,* v. 105, Jan. 15, 1957, p. 491-494.

Oxides grown on germanium by heating in oxygen are shown to inhibit interaction between the germanium and the ambient atmosphere. The decay time of the direct current field effect increases with increasing thickness of the oxide formed. The decay time decreases in the presence of water vapor, iodine, or ammonia in the ambient. The surface underneath a thick oxide is shown to be strongly n type and has a low value of surface recombination velocity.
(P13, P15; Ge)

125-P. Hall and Drift Mobility in High-Resistivity Single-Crystal Silicon. Donald C. Cronemeyer. *Physical Review,* v. 105, Jan. 15, 1957, p. 522-523.

Room-temperature Hall and drift mobilities for samples of single-crystal silicon ranging in resistivity from about 10^{-2} ohm centimeters to nearly intrinsic. 10 ref. (P15p; Si, 14-11)

126-P. The Characterization and Crystal Structure of Caesium Antimonide, a Photo-Electric Surface Material. K. H. Jack and M. M. Wachtel. *Royal Society, Proceedings,* v. 239A, Feb. 12, 1957, p. 48-60.

Although caesium antimonide is the most efficient photo-emitter known, no adequate explanation has been offered for its unique properties. The present X-ray investigation shows that it is a normal valency intermetallic compound with a small range of homogeneity near to the composition Cs_3Sb. 34 ref.
(P15k, M26q; Cs, Sb)

127-P. (German.) **The Reflection of Ions and the Secondary Electron Emission on Alkali Ion Bombardment of Surfaces of Pure Molybdenum.** Curt Brunnée. *Zeitschrift fuer Physik,* v. 147, no. 2, 1957, p. 161-183. (CMA)

The reflection of ions and the secondary electron emission of pure molybdenum surfaces bombarded with alkali ions were studied with the 60° mass spectrometer. The results indicate that the reflection of ions occurs by isotropic multiple back scattering and that the ions produce secondary electron emission in the metal by ionization processes corresponding to their energy and direction distribution. 95 ref.
(P15k, 1-4; Mo-a)

128-P. (Hungarian.) **Reduction of Titanium, Vanadium and Tungsten Oxides.** Aurél Horvah. *Kohászati Lapok,* v. 11, no. 11-12, 1956, p. 497-505. (CMA)

The thermodynamic potential (ΔG_T) of titanium, vanadium and tungsten oxides can be calculated from basic thermodynamic data. The intersection of the function $\Delta G_T = \psi(T)$ for the oxides and for the reducing agents indicates the starting temperature of the reduction. The curves also indicate which oxides can be reduced directly or indirectly in the liquid and solid

phases. From the relation between the oxygen absorbability of the liquid metal, their partial molar and integral thermodynamic potential and the oxygen mole fractions ($\Delta G_{o2} = \psi(x_o)$), it was deduced that a reducing agent is not necessarily suitable for the production of the metal only because its oxygen affinity is larger than that of the metal, mainly because the oxygen absorbability increases so tremendously in the metallic phase. 4 refs. (P12, N16m; Ti, V, W, 14-18)

129-P. Studies Relating to the Reaction Between Zirconium and Water at High Temperatures. A. W. Lemmon, Jr. Battelle Memorial Institute. *U.S. Atomic Energy Commission,* BMI-1154, Jan. 3, 1957, 114 p. (CMA)

Data are reported from studies of the reaction rate between solid and molten Zircaloy and steam, the spectral and total emissivity of Zircaloy and its oxide, and the rate of oxygen diffusion into Zircaloy. Part of the reaction rate study covered the amount of reaction expected for a molten drop of Zircaloy falling through water; temperature variations around the drop were considered by use of a theoretical model. (P13b, 2-12, R11d; Zr)

130-P. Magnetic Properties of Holmium and Thulium. B. L. Rhodes, Sam Legvold and F. H. Spedding. Iowa State College, *U.S. Atomic Energy Commission,* ISC-701, Dec. 1955, 58 p. (CMA)

Measurement of the antiferromagnetic and paramagnetic properties of holmium and thulium shows that both have these kinds of behavior in different temperature regions. Values of the magnetic moment were observed that exceeded the spin-only contribution. Temperatures below the Néel point were obtained for thulium. 35 ref. (P16; Ho, Tm)

131-P. Electrical Properties of Magnesium Silicide and Magnesium Germanide. Charles R. Whitsett and G. C. Danielson. Iowa State College, *U.S. Atomic Energy Commission,* ISC-714, July 1955, 81 p.

Single crystals of magnesium silicide and magnesium germanide, of high purity, were obtained, and measurements were made of their electrical resistivities and Hall coefficients in temperature range 60-1000° K. 63 ref. (P15g; Mg, Si, Ge, 14-18)

132-P. Anomalous Electron Emission From Metallic Surfaces. F. R. Brotzen. (Naval Research Laboratory) *U.S. Office of Technical Services,* PB 111938, Sept. 1956, 12 p. $.50.

Heating and cooling tests on low-melting abraded metals and alloys were undertaken in an effort to determine why electrons are irregularly emitted from the metal surfaces at temperatures below those characteristic of thermionic emission. The solidification of tin, bismuth and cadmium was found to be associated with an anomalously high emission rate. Lead, lead-tin alloys and a cadmium-tin alloy had no emission peaks during solidification. (P15k, N12; Sn, Bi, Cd, Pb)

133-P. Fundamental Properties of Metal-Ceramics Mixtures at High Temperatures. Alfred University (Office of Naval Research). *U.S. Office of Technical Services,* PB 121413, Jan. 1955, 103 p. $2.75.

High-stress high-temperature applications conducted for the Navy are summarized in a final report. New compositions were formulated from mixtures of metals and oxides and from lesser known metalloid and intermetallic compounds. Evaluation methods and criteria were established and theoretical concepts were developed to explain observed behavior in the new metal-ceramics mixtures.
(P general, Q general; 6-20)

134-P. Magnetic Properties of 6.4 Percent Silicon-Iron Sheet Material. J. F. Nachman and W. J. Buehler. (U.S. Naval Ordnance Laboratory.) *U.S. Office of Technical Services,* PB 121545, May 1956, 20 p. $.50.

A silicon-iron alloy which showed promise for synchro, transformer and magnetic amplifier applications was produced and evaluated. (P16; Fe, *Si*)

135-P. (Report.) **The Distribution of Plutonium and Fission Products Between Molten Uranium and Molten Uranium Trifluoride—Barium Halide Mixtures.** F. S. Martin and E. W. Hooper. *British Atomic Energy Research Establishment,* A.E.R.E. C/R 2083, 1956, 106 p.

The distribution of plutonium between molten uranium and mixture of uranium trifluoride with barium chloride or fluoride has been measured at temperatures of 1200-1400° C. The equilibrium constant for the reaction $Pu - UF_3 \rightleftharpoons PuF_3 + U_{16}$ found to be 72 + 50% calculated on a mole fraction basis. 11 ref. (P12d; Pu, U)

136-P. (Book.) **Principles of Engineering Heat Transfer.** Warren H. Giedt. 372 p., 1957. D. Van Nostrand Co., Inc., 257 Fourth Ave., New York 10, N. Y. $8.25.

A text for college engineers of junior level. Over-all picture of energy transfer is discussed. Conduction, convection and radiation are studied separately. Coverage on fluid flow is similar to that presented in undergraduate courses in fluid mechanics and is included preparatory to the study on convection. Physical interpretation as well as extensive analytical material is included. (P11)

137-P. Heat of Formation and Entropy of Titanium Tetrachloride. W. F. Krieve, et al. California Institute of Technology. Jet Propulsion Laboratory. Report 20-219. Jan. 1954. *U.S. Office of Technical Services,* PB 121734, 17 p. (CMA)

The heat of formation of $TiCl_4$ was determined by direct chlorination, using the spontaneity of the reaction with titanium. The solubility of chlorine in $TiCl_4$ was determined to provide data for volumetric corrections and corrections for the heat of solution. Equipment is described. (P12s; Ti, 14-18)

138-P. Low-Pressure Solubility and Diffusion of Hydrogen in Zirconium. M. W. Mallett and W. M. Albrecht. *Electrochemical Society Journal,* v. 104, Mar. 1957, p. 142-146. (CMA)

Hydrogen solubility in alpha and beta Zr and in two zirconium-oxygen alloys determined at low pressures in the range from 700 to 1000° C. Hydrogen solubility increases with increasing oxygen content and decreasing temperature. Diffusion coefficients in alpha-zirconium were determined for the 300 to 600° C. range and degassing coefficients for 600 to 800° C. The latter were lower than expected, indicating that degassing does not proceed purely by diffusion. (P12e, N1; Zr, *H*)

139-P. New Test Checks Electroplating Porosity. F. Ogburn. *Iron Age,* v. 179, Mar. 7, 1957, p. 123-126.

Radiographic tests of plating were made with radio-isotopes of iron, cobalt or nickel or by X-ray exposure. Technique can be useful in detecting discontinuities in coating. Method limited by basis metal, uniformity and thickness and by grain size of film used.
(P10m, 1-4; Fe, Co, Ni, 8-12, 14-13)

140-P. Annealing of Cold-Worked Copper by Electron Irradiation. C. J. Meechan. *Journal of Applied Physics,* v. 28, Feb. 1957, p. 197-200.

Copper wires were cold worked at room temperature to approximately 15% reduction in area and were then irradiated at temperatures between 100 and 150° C. with 1.25-megelectron volts. The residual resistivity was observed to decrease as a function of exposure at temperatures above 100° C. The higher the temperature at which the irradiation was performed, the greater was the rate of resistivity decrease.
(P15g, 2-17, 2-11; Cu)

141-P. Thermionic Constants and Sorption Properties of Hafnium. H. D. Hagstrum. *Journal of Applied Physics,* v. 28, Mar. 1957, p. 323-328. (CMA)

The thermionic emission of hafnium was measured in the range from 1250 to 1820° K. No gas was desorbed when hafnium was flashed to 2150° K. after cooling for 64 hr. Electron ejection measurements on an oxygen-contaminated hafnium sample indicated that the surface was covered with an appreciable monolayer after cooling from high temperature. The work function increases as the metal irreversibly absorbs gas on heating.
(P17d, P17c, 2-12; Hf)

142-P. Magnetic Susceptibility of Dilute Alloys of Nickel in Copper Between 2.5° K. and 295° K. E. Wm. Puch, B. R. Coles, A. Arrott and J. E. Goldman. *Physical Review,* v. 105, Feb. 1, 1957, p. 814-818.

Magnetic susceptibilities of pure copper and dilute copper-nickel alloys containing 0.59, 1.16 and 2.48 at. % nickel measured by a Gouy method at temperatures between 295 and 2.5° K. At room temperature all the alloys were found to be diamagnetic, the numerical value of the susceptibility decreasing with increasing nickel content. The paramagnetic contributions found at low temperatures were considerably smaller than previously reported.
(P16, 2-11; Cu, *Ni*)

143-P. Transport Properties of Dilute Binary Magnesium Alloys. Edward I. Salkovitz, Albert I. Schindlter and Erwin W. Kammer. *Physical Review,* v. 105, Feb. 1, 1957, p. 887-896.

If the overlap model is even only qualitatively correct, measurement of electron transport properties should be sensitive to electron over-

lap. Such measurements were made on the resistivity, temperature variation of resistivity, Hall coefficient, and thermoelectric power. (P15; Mg)

144-P. On the Complex Permeability of Iron-Nickel Alloys at High Temperatures. J. C. Anderson and B. Donovan. *Physical Society, Proceedings, Section B.,* v. 70, Pt. 2, Feb. 1957, p. 180-191.

The real and imaginary parts of the complex permeability have been measured for a series of iron-nickel alloys in the frequency range 300-400 megacycles per sec. The frequency of the internal resonance observable in this region has been investigated as a function of compositions and is found to pass through a minimum in the neighborhood of 70% nickel.
(P16q, 2-10; Fe, Ni)

145-P. Physical Properties of Magnesium Fluoride Slag. D. S. Arnold. Paper from "Processing of Uranium—Magnesium Fluoride Slag", *U.S. Atomic Energy Commission,* TID-7528 (Pt. 1), Dec. 1956, p. 1-11.

Physical properties. X-ray diffraction and microscopic examinations indicating nature of the uranium dispersion in the slag demonstrate that the uranium occurs in the slag as highly dispersed, very fine globules of either uranium metal or uranium oxide. 7 ref.
(P general, N12; U, RM-q)

146-P. Wetting Temperatures of Fuel Element Components With Sodium and NaK. G. G. Bentle, H. Strahl and J. Droher. Paper from "Metallurgical Information Meeting, Ames Laboratory", *U.S. Atomic Energy Commission,* TID-7526 (Pt. 1), Feb. 1957, p. 16-27.

The temperatures of wetting of stainless steel, uranium, thorium, and thorium-uranium alloys with sodium and sodium-potassium alloy determined. The parameters of surface condition, wetting fluid, and composition of material investigated as to their effect on wetting temperatures. Cyclographic tests of fuel elements in which sodium or sodium potassium alloy is the bonding fluid are reported. 7 ref.
(P13, T11g; SS, U, Th, *Na*)

147-P. Effect of Variation of Temperature and Pressure on Composition of Alloys. W. M. Spicer. Georgia Institute of Technology (U.S. Air Research and Development Command), *U.S. Office of Technical Services,* PB 121235, 1955, 56 p.

Theoretical prediction that a concentration gradient develops in a solid alloy as a result of a temperature change. The basis for the research was the assumption that a change in composition may develop in a portion of an alloy of uniform composition if the remainder of the alloy is held at a different temperature or subjected to a high pressure. Results of the temperature effect, especially on lead-tin and aluminum-zinc alloys, indicated that a concentration change did develop with the temperature gradient.
(P12, 2-11, 3-24; Al, *Zn*)

148-P. (English.) **Thermal Conductance of Contracts Between Aluminum and Other Metals.** F. Boeshoten and E. F. Van Der Held. *Physica,* v. 23, Jan. 1957, p. 37-44.

Coefficient of heat transfer of a joint between aluminum and aluminum, steel and uranium respectively, measured. The gap between the metal surfaces was filled with air, helium or hydrogen of gas pressures varying between 1 and 750 mm. Hg. Some oils were introduced in the joint. 5 ref. (P11h; Al, ST, U)

149-P. (English.) **Measurements on the Magnetic Susceptibility of White Tin and Copper Down to Liquid Helium Temperatures.** A. Van Itterback and W. Duchateau. *Physica,* v. 23, Jan. 1957, p. 169-172.

Measurements carried out on the magnetic susceptibility of pure tin (polycrystalline and a single crystal) and copper between room temperature and 2° K. For the polycrystalline tin, which is paramagnetic, a decrease of 16% is found for the susceptibility between room temperature and 2° K. For a single crystal of tin only a decrease of 10% was found. (P16, 2-13; Sn, Cu)

150-P. (English.) **Thermal Expansion Coefficient, Rigidity Modulus and Its Temperature Coefficient of the Alloys of Iron, Nickel, Cobalt and Chrominum and Relation of Super-Invar to Stainless Invar and of Elinvar to Co-Elinvar.** Hakaru Masumoto, Hideo Saito, Tatsuo Kono and Yutaka Sugai. *Tohoku University, Science Reports of the Research Institutes,* v. 8A, Dec. 1956, p. 471-483.

There are two ranges of the minimum values of the expansion coefficient or the maximum values of the positive temperature coefficient

of the modulus, one of which originates at the composition of Invar, that is, in the neighborhood of the composition of super Invar, or Elinvar in the binary system of iron and nickel, and the other at those of stainless Invar or Co-Elinvar in the ternary system of iron, cobalt and chromium.
(P11g, Q21; Fe, Ni, Co, Cr, SGA-n)

151-P. (English.) **Thermodynamic Activities in Iron-Cobalt Solid Solutions.** Tsuneo Satow, Sukeji Kachi and Keizo Iwase. *Tohoku University. Science Reports of the Research Institutes,* v. 8A, Dec. 1956, p. 502-510.

Thermodynamic properties of gamma, alpha and superlattice phases of iron-cobalt alloys were studied from the equilibrium among water, hydrogen and various alloys. The heat of mixing in the gamma phase showed almost ideal behavior, and activity obeyed Raoult's Law. In the alpha phase, the activity showed negative deviation from Raoult's Law. (P12b; Fe, Co, 14-17)

152-P. (French.) **Absorption Spectra K of Palladium in the Pure Metal and in the Alloys Pd-Au.** Chintamani Mande. *Comptes Rendus,* v. 244, Feb. 4, 1957, p. 747-749.

Studies the forms of the discontinuities K palladium in pure palladium and in the two alloys Pd-Au. For the first time the discontinuity K of palladium has been resolved. (P17e, S11k; Pd, Au)

153-P. Thermal and Electrical Conductivity of Rhodium, Iridium, and Platinum. G. K. White and S. B. Woods. *Canadian Journal of Physics,* v. 35, Mar. 1957, p. 248-257.

Rapid rate of decrease of the "ideal" thermal and electrical resistivities with temperature, particularly in rhodium and iridium, suggests that s-d transitions are not a dominant resistive mechanism at low temperatures in these metals, in contrast to palladium, iron and nickel. 19 ref. (P11h, P15g; Rh, Ir, Pt)

154-P. Electrical Resistance of Some Metals and Alloys Below 1° K. J. S. Dugdale and D. K. C. MacDonald. *Canadian Journal of Physics,* v. 35, Mar. 1957, p. 271-279.

Measurements of electrical resistance below 1° K. are described, including experiments to estimate the thermal contact resistance between the paramagnetic salt and gold wires which were subsequently used as secondary thermometers; the resistance of a dilute copper alloy, a lithium-magnesium alloy, and a sodium specimen was measured. 14 ref. (P15g, 2-13; Cu, Li, Mg, Na)

155-P. New Type of Magnetic Transition in Mn_3ZnC. B. N. Brockhouse and H. P. Myers. *Canadian Journal of Physics,* v. 35, Mar. 1957, p. 313-323.

Alloys with the approximate composition of manganese, zinc-carbon (Mn_3ZnC) are known to be ferromagnetic but the saturation magnetization shows a maximum in the region of 231° K.; X-ray and neutron diffraction measurements are reported which demonstrate that at 231° K. there is a second order transition below which ordering of the manganese ions occurs, resulting in a tetragonal distortion of the normally cubic lattice and a complex magnetic structure; one possible magnetic structure is discussed. 14 ref. (P16, N11h; Mn, Zn)

156-P. Conductivity of Alpha-Manganese. G. K. White and S. B. Woods. *Canadian Journal of Physics,* v. 35, Mar. 1957, p. 346-348.

Measurements of electrical and thermal resistance on electrolytic flake manganese in a cryostat which could be controlled at temperatures from 2° K. up to room temperature. 14 ref. (P11h, P15g; Mn)

157-P. Program for Fundamental Research in Hard Metals. Pol Duwez. *Journal of Metals,* v. 9, Feb. 1957, p. 250-251.

Need for a systematic study of physical properties of hard metals as an aid to the metallurgist. Brief discussion of the theory of atomic bonding, and possibilities of paramagnetic resonance spectroscopy. (P general, M25; EG-d37)

158-P. (German.) **New Methods in Thermodynamics and in the Calorimetry of Alloys. Their Applications to Iron and Steel.** W. Oelsen and B. Schurmann. *Giesserei,* v. 44, Feb. 28, 1957, p. 113-120.

Significance of the theory of heat for the metallurgist and foundryman. The present state of calorimetry. Conclusions drawn from the heat content curves of lead-cadmium alloys. Latest development of the Bunsen ice calorimeter. Heat content curves of iron-carbon alloys. Measurement of the change in volume and the magnetic properties in the calorimeter.
(P12, X24; Fe, ST)

159-P. (Book.) **Metallurgical Thermochemistry.** O. Kubaschewski and E. Ll. Evans. 410 p. 1956. John Wiley and Sons, Inc., 440 Fourth Ave., New York 16, N. Y. $10.00.

The first section of the book discusses the theoretical basis, and consists largely of formulas necessary for applying fundamental data to reaction problems. Following this, the authors describe the main experimental techniques used to determine the thermochemical data, and point out the relative advantages and disadvantages of the various methods. A third section describes methods of estimating values that cannot ordinarily be determined. In Part 4, the authors supply, via tabular form, the values of thermochemical constants for a large number of elements and compounds of possible metallurgical importance. The final section of the book contains examples of the practical applications of thermochemical methods. (P13, P12)

160-P. Reproducing the Properties of Alnico Permanent Magnet Alloys With Elongated Single-Domain Cobalt-Iron Particles. F. E. Luborsky, L. I. Mendelsohn and T. O. Paine. *Journal of Applied Physics,* v. 28, Mar. 1957, p. 344-351.

Single-domain particles of 40-60 cobalt-iron alloy have been prepared with a median diameter of 200 angstrom units, a median elongation of 5.4:1, and intrinsic coercive force of 1950 oersteds. By compacting these particles to various packing densities and degrees of alignment, shape anisotropy fine-particle magnets have been made with magnetic properties duplicating those of each of the Alnico permanent magnet alloys, including maximum energy product values above five million gauss-oersteds. It is concluded that the Alnico alloys and the fine-particle magnets derive their properties from very similar, but not identical, shape anisotropy effects. 17 ref.
(P16; Co, Fe, SGA-n)

161-P. Thermal Expansion of Some Nickel Alloys. Peter Hidnert. *Journal of Research of the National Bureau of Standards,* v. 58, Feb. 1957, p. 89-92.

Data on the linear thermal expansion of some nickel alloys (manganese nickel, Hoskins Alloy 667) Inconel, Evanohm, Monel metal, M-M-M alloy, (Illumalloy and Waspalloy) for various temperature ranges between 20 and 1000° C. are given. The coefficients of expansion of the alloys are tabulated. The effects of additions of copper, cobalt and iron to nickel-chromium alloys (0 to 24% Cr) are indicated. 8 ref.
(P11g; Ni, 1-10)

162-P. Isotopic Exchange and Evolution of Metal Surfaces in Electrolytic Solutions. U. Camerini, J. Danon and M. Malagolowkin. *Notas de Fisica,* v. 3, no. 8, 12 p.

Investigation of tracer decay by alpha-particle emission; loss of energy detected by measuring the range of the alpha-particles in nuclear emulsions. 17 ref. (P18h, 1-4)

163-P. Influence of Lattice Defects on the Electrical Properties of Cold Worked Metals. H. G. Van Bueren. *Philips Research Reports,* v. 12, Feb. 1957, p. 1-45.

Change of electrical resistivity and of magnetoresistivity, caused by plastic deformation, of the monovalent noble metals from both a theoretical and an experimental point of view. (P15, 3-18, M26s)

164-P. Properties of Gold-Doped Silicon. C. B. Collins, R. O. Carlson and C. J. Gallagher. *Physical Review,* v. 105, Feb. 15, 1957, p. 1168-1173.

Measurement of the temperature dependence of resistivity and Hall coefficient in gold-doped silicon show an acceptor level at 0.54 electron volt from the conduction band and a donor level at 0.35 electron volt from the valence band.
(P15g; Si, *Au*)

165-P. Atomic Heats of Normal and Superconducting Thallium. J. W. Snider and J. Nicol. *Physical Review,* v. 105, Feb. 15, 1957, p. 1242-1246.

The atomic heats of thallium have been measured in the liquid helium temperature range. In the normal state, the atomic heat varies with temperature. Equations given for total atomic heat and superconducting electronic specific heat.
(P12, P15; Tl)

166-P. Heat Transfer and Thermodynamic Properties of Molten Alkali Metals. I. I. Norikov, A. N. Solovyev, E. M. Khapak Pasheva, V. A. Gruzder, A. I. Pridanter and M. Ya. Vasonina. *Soviet Journal of Atomic Energy,* no. 4, 1956, p. 545-560. (Translated by Consultants Bureau, Inc., 227 W. 17th St., New York 11, N. Y.

An investigation of heat transfer to molten sodium during turbulent flow in a round copper or nickel

tube. An interpolation formula was obtained. Results are given for measurements of these physical parameters for molten alkali metals in a broad interval temperature. 18 ref. (P11k, P12; Na, EG-e)

167-P. (French.) **Microscopic Study by Photo-Emission of Metals Submitted to a Mechanical Stress.** Robert Goutte, Clement Guillaud and Robert Arnal. *Comptes Rendus,* v. 243, Dec. 17, 1956, p. 2026-2028.

Measures of photo-electric emission have been effected on metals subjected to stress and have called into evidence an increase in the photo-electric emission on the application of a mechanical stress to the sample; this increase seems reversible if the stress does not exceed the limit of the elasticity of the metal and irreversible in the case of a plastic deformation. 2 ref. (P17d, 3-18)

168-P. (French.) **Properties of Gallium in Thin Layers.** Jean Tortosa. *Comptes Rendus,* v. 243, Dec. 17, 1957, p. 2031-2034.

Study of certain optical and electrical properties of thin films of gallium. 4 ref. (P15, P17; Ga, 14-12)

169-P. (French.) **Influence of the Curie Point on the Oxidation of Magnetite, Fe_3O_4, Iron, Nickel and Certain Iron Alloys.** Laurent Seigneurin and Hubert Forestier. *Comptes Rendus,* v. 243, Dec. 17, 1956, p. 2052-2054.

Ferromagnetic bodies present an anomaly of chemical reactivity at the Curie point. Studies the phenomena of oxidation in the case of iron, nickel, magnetite and certain iron alloys whose Curie point differs from that of pure iron. 4 ref. (P16d, R1h; Fe, Ni)

170-P. (French.) **Study of Hydrogenized Palladium-Nickel and Palladium-Cobalt Alloys.** Joseph Cohen and Jules Wucher. *Comptes Rendus,* v. 244, Jan. 2, 1957, p. 49-52.

Palladium-nickel and palladium-cobalt alloys are ferromagnetic but by saturating these alloys with hydrogen the magnetic moment of palladium disappears. This treatment does not, however, change the ferromagnetic Curie point of the alloy. 7 ref. (P16d; Pd, *Ni, Co, H*)

171-P. (French.) **Note on the Changes in the Electrical Conductivity of Metals at the Time of Melting.** Genevieve Darmois. *Comptes Rendus,* v. 244, Jan. 7, 1957, p. 174-176.

Electronic theory of the conductivity of metals; experimental data and analysis. 3 ref. (P15g)

172-P. (French.) **Surface Tension of Iron, Cobalt and Nickel at 1500° C.** Paul Kozakevitch and Georges Urbain. *Comptes Rendus,* v. 245, Jan. 14, 1957, p. 335-337.

Measurement of the surface tension of iron, cobalt and liquid nickel by a method utilizing a globule placed on a refractory support. 7 ref. (P13h, 1-4; Fe, Co, Ni)

173-P. (German.) **The Effect of High-Energy Radiation on Raw Materials.** W. Hanle. *Metall,* v. 11, Feb. 1957, p. 91-99.

Importance of knowledge about interaction of matter with high-energy radiation for nuclear reactor technology; application of radiation-proof materials; very high doses necessary to affect metals. In plastics interesting changes occur with only small doses of radiation. 54 ref. (P18, W11, 17-7, 2-17)

174-P. Dimensional Changes in Nickel Zinc Ferrite in the Neighborhood of the Curie Temperature. R. C. Deshpande. *Indian Institute of Metals, Transactions,* v. 8, 1954-55, p. 253-259.

Dimensional behavior of nickel zinc ferrite has been followed by means of back reflection powder camera in which a suitable furnace is incorporated to heat the specimen. The Curie temperatures have been found as 78 and 95° C. from graphs of initial permeability vs. temperature. X-ray patterns show the structure to be a single-phase spine. 6 ref. (P10d, P16d; Fe, Ni, Zn)

175-P. An Investigation of the Eddy-Current Anomaly in a Low-Silicon Sheet Steel. H. Aspden. *Institution of Electrical Engineers, Proceedings,* Pt. C, Mar. 1957, p. 2-7.

The eddy-current anomaly effects in an 0.019-in. thick low-silicon sheet steel are investigated and analyzed on the basis of the magnetic inhomogeneity arising from ferromagnetic domain structure. The results obtained are interpreted in terms of a hypothetical domain configuration, and it is concluded that the magnetic inhomogeneity arising from ferromagnetic domain structure does account for the eddy-current anomaly, distortion and time-lag effects. (P16c; AY, *Si*, 4-3)

176-P. High-Temperature Properties of Tungsten Which Influence Fila-

ment Temperatures, Lives and Thermionic-Emission Densities. R. N. Bloomer. *Institute of Electrical Engineers, Proceedings,* Pt. B, v. 104, Mar. 1957, p. 153-157.

Filament lives have been calculated and measured for a variety of electrical supply conditions in a range of high temperatures. The fractional thinning at burn-out can be found from a measurement of the ratio of lives under different electrical supply conditions. 17 ref. (P15k, S21, 2-12; W, SGA-r)

177-P. A Direct Measurement of the Uranium Metal Temperature Coefficient of Reactivity. R. M. Pearce and D. H. Walker. *Nuclear Science and Engineering,* v. 2, Feb. 1957, p. 24-32.

A uranium sample was oscillated in the reactor and the resulting modulation of reactor power was measured as a function of the sample temperature. The temperature coefficient of uniformly heated uranium rods, 3.25 cm. in diameter, immersed in a constant-temperature moderator (moderator-to-uranium volume ratio 22) is deduced from this experiment. (P12b, 1-4; U)

178-P. Mechanism of Dimensional Instability of Uranium. L. L. Seigle and A. J. Opinsky. *Nuclear Science and Engineering,* v. 2, Feb. 1957, p. 38-48.

An explanation of the dimensional instability of alpha uranium under irradiation is advanced, based upon the anisotropic diffusion of lattice imperfections to grain boundaries and free surfaces. An approximate solution of the diffusion equations for an ellipsoidal grain is obtained, which predicts growth rate as a function of pile flux, temperature and grain size. 22 ref. (P10d, N1b, 2-17; U)

179-P. Research on Properties of Rare Metals. Final Report and Supplements. J. E. Goldman, Simon Foner and George L. Guthrie. Carnegie Institute of Technology. *U.S. Atomic Energy Commission,* NYO-7257, Aug. 31, 1956, 36 p.

The Hall effect in titanium, vanadium, chromium and manganese has been measured at room temperature with fields up to 30 kilo-oersteds. The Hall constant was positive for all of these elements. The results for these transition elements indicate that electrical conduction is predominantly due to hole conduction. (P15g; Ti, V, Cr, Mn)

180-P. Electric, Thermoelectric, Hardness, and Corrosion Properties of Vanadium-Base Alloys. H. J. Cleary. *U.S. Atomic Energy Commission,* NMI-1161, Sept. 5, 1956, 34 p. (CMA)

Various properties of the alloys with 1% Pd, 0.6% Zr, 1% Ti, 0.9% Fe, 0.75% Mn, 1% Cr, 0.8% Cu, 0.8% Ni, 0.9% Sb, 1% Sn, 1.1% Al, 3% Al, 17.3% Al and 25% Al were measured. (P15, Q29n, R general; V)

181-P. Basic Chemistry of High-Temperature Inorganic Systems. Semi-Annual Progress Report. Jan-June 1956. S. J. Yosium and T. A. Milne, North American Aviation, Inc. *U.S. Atomic Energy Commission,* NAA-SR-1797, Mar. 1, 1957, 23 p.

Experiments dealing with the vapor pressure of thorium and thorium tetrafluoride are described. (P12c; Th)

182-P. The Hall Effect in Zirconium and Hafnium. S. Foner. *U.S. Atomic Energy Commission,* NYO-7257, Aug. 31, 1957, p. 23-30. (CMA)

Measurements at 25° C. of the Hall effect in zirconium and hafnium showed Hall effect coefficients of $+12.6 \times 10^{-13}$ and -0.16×10^{-13} v-cm./amp.-gauss, respectively. The contribution of hole conduction to the electrical conductivity appears to be appreciable. (P15g; Zr, Hf)

183-P. Development of Calorimetric Techniques Leading to Measurements on Zirconium. G. L. Guthrie. *U.S. Atomic Energy Commission,* NYO-7257, Aug. 31, 1957, p. 31-36. (CMA)

Development of method and equipment. Calorimetric experiments were conducted with zirconium, but no results are reported. (P12, 1-3; Zr)

184-P. Survey of Physical-Property Data for Titanium and Titanium Alloys. H. W. Deem and C. F. Lucks. Battelle Memorial Institute. *U.S. Office of Technical Services,* Report 39, PB121613, Mar. 1956, 37 p. (CMA)

Literature survey conducted on physical property data for titanium and its alloys. Eighteen properties are covered. (P general; Ti)

185-P. (French.) **On the Measurement of the Coefficient of Thermal Convection of Metallic Wires of Different Sizes.** Israel Epelboin and André Vapaille. *Comptes Rendus,* v. 245, Jan. 14, 1957, p. 314-316.

The determination of the heating theta, assuming the resistance, R, is not to be established by means of the analytic relations recommended in the literature but rather by the aid of an R (theta) curve calculated experimentally. 11 ref. (P11j; 4-11)

186-P. (German.) **The Effect of Small Quantities of Alloying Elements and Impurities on Some Physical Properties of Aluminium.** A. Domony. *Acta Technica Academiae Scientiarum Hungaricae,* v. 16, 1957, p. 153-161.

The electrical conductivity of aluminum depends mainly on the quality of the dissolved elements in the matrix, such as silicon, titanium and vanadium. Tensile strength also depends on the quantity of the impurities present. Distribution of the alloying elements within the metal is also significant. (P15g, Q27a, 2-10, 3-19; Al)

187-P. (Japanese.) **Thermodynamic Investigation of Nonmetallic Inclusions in Steel —Pt. 11. Behavior of Titanium, Zirconium and Vanadium Nitrides and Carbides and Their Effect on Austenitic Grain Size of Steel.** H. Sawamura and T. Mori. *Iron and Steel Institute of Japan, Journal,* v. 43, Jan. 1957, p. 31-38. (CMA)

The free energy equations of the formation in steel of the nitrides and carbides of titanium, zirconium, and vanadium are derived and are used in calculating equilibrium relations of these compounds. TiC, TiN, ZrC and ZrN are effective grain growth inhibitors, especially when precipitated in austenite. V_4C_3 and vanadium nitride may be effective inhibitors. "VC" does not precipitate in steel. (P12a; ST, *Ti, Zr, V,* 9-19)

188-P. Papers of the International Conference on Electron Transport in Metals, Ottawa, Sept., 1956. *Canadian Journal of Physics,* v. 34, no. 12A (Suppl.), Dec. 1956, p. 1171-1423.

Longer papers abstracted separately. (P15)

189-P. On Some Electrical and Magnetic Properties of Metallic Solid Solutions. J. Friedel. *Canadian Journal of Physics,* v. 34, no. 12A (Suppl.), Dec. 1956, p. 1190-1211.

The resistivity, thermo-electric power and magnetic susceptibility of solid solutions at room temperature reviewed. The special properties of transitional impurities are related to the emptying of the *d* shells. 61 ref. (P15, P16, 2-19; 14-17)

190-P. Remarks on the Anomalous Behavior of Alloys Containing Traces of Manganese or Similar Elements. C. J. Gorter, G. J. Van den Berg and J. De Nobel. *Canadian Journal of Physics,* v. 34, no. 12A (Suppl.), Dec. 1956, p. 1281-1284.

Review dealing with electrical conductivity, magnetoresistance, susceptibility, magnetic resonances, thermo-electricity, specific heat, thermal conductivity and Hall effect. 10 ref. (P15, P16, 2-10; *Mn*)

191-P. Nuclear Magnetic Resonance and Electronic Structure of Conductors. V. Bloembergen. *Canadian Journal of Physics,* v. 34, no. 12A (Suppl.), Dec. 1956, p. 1299-1314.

Isotropic and anisotropic metallic shift, the relaxation time, isotropic and anisotropic spin exchange coupling and quadruple interactions discussed. Recent results for semiconductors and superconductors included. 34 ref. (P16f, P15)

192-P. On the Transition to Metallic Conduction in Semiconductors. N. F. Mott. *Canadian Journal of Physics,* v. 34, no. 12A (Suppl.), Dec. 1956, p. 1356-1368.

Conductivity to be expected from a crystalline array of atoms when the interatomic distance *a* is varied. Applications are made to impurity-bond conduction in semiconduction, the impurity center being treated by the usual model as expanded atoms in a uniform dielectric. 24 ref. (P15g)

193-P. Chemical Bond in Semiconductors. The Group V B to VII B Elements and Compounds Formed Between Them. E. Mooser and W. B. Pearson. *Canadian Journal of Physics,* v. 34, no. 12A (Suppl.), Dec. 1956, p. 1369-1376.

Developments which led to an understanding of the important role played by chemical bonding in semiconductors. Electrical and optical properties discussed. 35 ref. (P15g, P17)

194-P. Specific Heats of Some Metallic Elements. Pt. 3. Characteristic Frequencies. C. V. Raman. *Indian Academy of Sciences, Proceedings,* Section A, v. 45, Feb. 1957, p. 59-64.

The experimental data for the specific heat at constant volume of aluminum, copper, silver and lead were analyzed. The method of analysis was a determination, with the aid of a table of Einstein's specific heat function, of the fre-

quency of atomic vibration which, if assumed to be common to all the atomic oscillators, would give for the specific heat of the solid its observed value at any given temperature. (P12r; Al, Cu, Ag, Pb)

195-P. Magnetostriction and Magnetic Anisotropy of MnBi. H. J. Williams, R. C. Sherwood and O. L. Boothby. *Journal of Applied Physics,* v. 28, Apr. 1957, p. 445-447.

The magnetostriction of oriented polycrystalline manganese-bismuthide was found to be higher than any published value for a metal. A value of -250×10^{-6} was measured parallel to a field of 22,000 oersteds oriented perpendicular to the c axis of the aligned hexagonal crystallites. This field magnetized the specimen to only slightly more than half of saturation. 8 ref. (P16b; Mn, Bi)

196-P. Magnetic Viscosity in 4-79 Molybdenum Permalloy. Oscar J. Van Sant. *Journal of Applied Physics,* v. 28, Apr. 1957, p. 486-494.

The dynamic behavior of 4-79 molybdenum Permalloy operating in a reversible region of its hysteresis loop is analyzed theoretically and experimentally. A useful expression is presented which relates magnetic flux, magnetic intensity, time and magnetic viscosity. (P16; Ni, Mo)

197-P. Electrolytic Hydrogen Evolution Kinetics and Its Relation to the Electronic and Adsorptive Properties of the Metal. B. E. Conway and J. O'M. Bockris. *Journal of Chemical Physics,* v. 26, Mar. 1957, p. 532-541.

A significant correlation between the logarithm of the exchange current density of electrolytic hydrogen evolution reaction and the electronic work function is found for one group of metals. (P15; *H*)

198-P. Heat-Transfer and High-Temperature Properties of Liquid Alkali Metals. I. I. Novikov, A. N. Soloviev, E. M. Khabakhnasheva, V. A. Gruzdev, A. I. Pridantzev and M. Ya. Vasenina. *Journal of Nuclear Energy,* v. 4, Mar. 1957, p. 387-408.

The thermal resistances at the interfaces between liquid sodium and solid copper, nickel and stainless steel were investigated. Methods of measurement of the viscosity, thermal diffusivity and the density of liquid metals. Data on these properties of the liquid alkali metals (sodium, potassium, lithium, sodium-potassium-K eutectic alloy) are given throughout a wide temperature range. 18 ref. (P11k, P10a, P10f, 1-11; EG-e, 14-10)

199-P. Resistance Minimum of Magnesium: Electrical Resistivity Below 1° K. R. A. Hein and R. L. Falge. *Physical Review,* v. 105, Mar. 1, 1957, p. 1433-1434.

Measurements of the electrical resisitivity of the two magnesium specimens described by Spohr and Webber have been extended to temperatures below 1° K. At the lowest temperature at which data were obtained (0.22° K.), the electrical resistivities of both specimens were continuing to increase. (P15g, 1-13; Mg)

200-P. Resistance Minimum of Magnesium: Heat Capacity Between 3 and 13° K. J. K. Logan, J. R. Clement and H. R. Jeffers. *Physical Review,* v. 105, Mar. 1, 1957, p. 1435-1437.

Heat capacities were measured for two samples of slightly impure magnesium identical with those whose transport properties have been measured. Although the samples exhibit markedly different transport properties, any systematic difference in their specific heats was found to be less than 5% in the range of measurement. Atomic heat values were in agreement with earlier measurements on pure magnesium in this temperature range. (P12r; Mg)

201-P. Resistance Minimum in Magnesium: Magnetoresistance. R. T. Webber. *Physical Review,* v. 105, Mar. 1, 1957, p. 1437-1439.

The magnetoresistance of two specimens of magnesium has been measured at liquid helium temperatures in transverse magnetic fields up to 25 kilogauss. One specimen, containing 0.013% iron as the predominant impurity and previously shown to possess a minimum in the electrical resistivity at 4.5° K., demonstrated a magnetoresistance which followed Kohler's rule quite exactly. The second specimen, containing 0.043% manganese and previously shown to have a rather large negative magnetoresistance with temperature at helium temperatures, showed a small departure from Kohler's rule. (P16e, 2-13; Mg)

202-P. Neutron Production by Mu Mesons Stopped in Sodium and Magnesium. D. R. Jones. *Physical Review,* v. 105, Mar. 1, 1957, p. 1591-1598.

Measurements of the production of neutrons by negative Mu mesons which stop and interact in two materials, sodium and magnesium. The data confirm that neutron production in magnesium is less than in lead (multiplicity 1.7 = 0.3) but show that it is not zero. Neutron production in sodium also is shown to be measurable and probably greater than in magnesium, though less than in lead.
(P18h; Mg, Na)

203-P. Energy of Formation of Vacancies in Copper and Gold. P. Jongenburger. *Physical Review,* v. 106, Apr. 1, 1957, p. 66-69.

From the anomalous rise of the thermal expansion near the melting point, a value of about 0.7 electron volt for the energy of formation of vacancies in copper and gold is found. (P11g, M26s; Cu, Au)

204-P. Further Ultrasonic Experiments in Superconducting Polycrystalline Tin. L. Mackinnon. *Physical Review,* v. 106, Apr. 1, 1957, p. 70-72.

The effect of a longitudinal magnetic field on the sound absorption in a polycrystalline tin rod below and just above the superconducting transition has been studied.
(P15g, Q21f; Sn)

205-P. The Atomic Heat of Samarium From 2 to 20° K. L. M. Roberts. *Physical Society, Proceedings,* v 70, no. 448B, Apr. 1, 1957, p. 434-435. (CMA)

The magnetic susceptibility of samarium was measured in the range 2-20° K. in an effort to locate an anomaly in the specific heat. A sharp maximum in the atomic heat occurs at 13.6° K. and a small irregularity at 9.5° K. Entropy calculations of the maximum were made. (P12r, P12s; Sm)

206-P. Heat-Capacity Measurements of Titanium and of a Hydride of Titanium for Temperatures from 4 to 15° K. Including a Detailed Description of a Special Adiabatic Specific Heat Calorimeter. M. H. Aven, R. S. Craig and W. E. Wallace. National Advisory Committee for Aeronautics, Technical Note 3787. *U.S. Office of Technical Services,* PB 124368, Oct. 1956, 30 p. (CMA)

The heat capacity of titanium in the 4-15° K. range was measured and can be represented up to 13° K. by the expression $C = 3.38 \times 10^{-3}T + 2.596 \times 10^{-5}T^3$. The expression $C = 0.024\ T + 10^{-4}T^3$ represents the heat capacity of a sample of hydrided titanium. C is the heat capacity in joules per °K. and T is expressed in °K. The calorimeter used is described. 8 ref.
(P12r, 1-3; Ti)

207-P. Volume Change and Gas Evolution on Heating Electrolytic Chromium. K. A. Moon and G. A. Consolazio. Watertown Arsenal. *U.S. Office of Technical Services,* PB 121768, Jan. 1956, 15 p. $0.50.

When electrolytic chromium is heated in vacuum or in an inert atmosphere to a sufficiently high temperature, changes are induced which include a pronounced decrease in hardness, loss of gases and irreversible shrinkage of the specimen. A mass spectrometer and a dilatometer were used to study the interrelationships of these changes.
(P10d, Q29n, 1-3; Cr)

208-P. (English.) **On the Hall Effect in Bismuth at Low Temperature.** Hiroshi Hasegawa and S. Nakano. *Physical Society of Japan, Journal,* v. 12, Jan. 1957, p. 104.

Measurements of the Hall voltage in bismuth by J. M. Reynolds reanalyzed. (P15g, 2-13; Bi)

209-P. (German.) **Contribution to the Interpretation of the K-State of Resistance Alloys.** Horst G. Müller and Horst A. Schulze. *Zeitschrift für Metallkunde,* v. 48, Feb. 1957, p. 72-79.

Investigation of homogeneous nickel-iron-chromium alloys with a nickel-chromium ratio 4:1 in the K-state by X-ray and electrical conductivity measurements. Increase of low-temperature resistance with cold working. Lattice-work contraction during the formation of the K-state. 15 ref. (P15; Ni, Cr, SGA-q)

210-P. (German.) **Activation Energy of the Viscosity of Molten Metals.** Anton Hrbek. *Zeitschrift für Metallkunde,* v. 48, Mar. 1957, p. 134-137.

Equation of activation energy of viscosity of molten metals and alloys is found to be in agreement with experimental results. 28 ref.
(P10f, P13a; 14-10)

211-P. (German.) **Determination of Optical Constants of Neodymium in the Visible Spectrum and the Near Infrared.** E. Kerr. *Zeitschrift für Physik,* v. 148, no. 1, 1957, p. 38-52.

The absorption and reflection properties of thin sublimated films of

neodymium are integrated in the light of the electron theory of metals. Within the spectral range observed the absorption consists of three overlapping bands whose attribution to theoretical quantum states of the energy bands is impossible without arbitrary assumptions. The dispersion data give a value of 0.1 for the number of free electrons per neodymium atom, a value that agrees with the electroconductivity data. No influence of 4f electrons on the optical properties of neodymium was detected. 17 ref. (P17; Nd)

212-P. (Italian.) **Aspects and Problems of Metal Electrochemistry in Ten Years of Studies and Researches.** R. Piontelli. *Metallurgia Italiana,* v. 49, Feb. 1957, p. 69-88.

General aspects of today's metal electrochemistry, both theoretical and applied. 147 ref. (P15, C23, L17)

213-P. (Japanese.) **On the Magnetic Properties of Nickel Arsenide-Type Crystals.** Tokutaro Hirone and Kengo Adachi. *Physical Society of Japan, Journal,* v. 12, Feb. 1957, p. 156-163.

The formation of the ordered arrangement of the magnetic moments of cations (spin ordering or spin arrangement) in the crystal lattice of the nickel arsenide type is studied theoretically with the molecular field approximation, taking into account interaction between pairs of cations, which form the first, second or third neighbors in the crystal lattice. 11 ref. (P16, M26; Ni)

214-P. Effects of Pressure on Binary Alloys. Pt. V and VI. P. W. Bridgman. *American Academy of Arts and Sciences, Proceedings,* v. 84, no. 2, p. 131-177; 179-216.

Binary alloys of a number of metals with melting points not higher than a few hundred degrees were tested, and 14 metals with melting points ranging up to 1500° C. Temperature coefficient of resistance and the decrement of relative resistance are shown on following binary alloys: Cu-Si, Fe-Si, Ni-Si, Ag-Cu, Ag-Pd, Al-Cu, Al-Mg, Al-Zn, Au-Cu, Co-Fe, Cu-Gu, Cu-Ge, Cu-Ni, Cu-Zn and Mn-Ni. 13 ref. (P15g, M24b, 3-24)

215-P. Resistance Minimum of Magnesium: Electrical and Thermal Resistivities. D. A. Spohr and R. T. Webber. *Physical Review,* v. 105, Mar. 1, 1957, p. 1427-1433.

The electrical resistivity of the dilute manganese alloy specimen passed through a minimum at about 14° K. and increased by approximately 20% as the temperature was lowered to 1.5° K. An exactly analogous effect was found in the thermal resistivity as evidenced by (1) a constant Lorenz ratio at temperatures below 4° K., and (2) the equality of the percentage deviations of the respective resistivities from normal behavior over the entire range of measurements. 29 ref. (P15g, P11, 2-11; Mg)

216-P. Experimental Study of the Optical Properties of Metals and the Relation of the Results to the Drude Free Electron Theory. L. G. Schulz. *Advances in Physics,* v. 6, Jan. 1957, p. 102-144.

Experimental aspects of Drude free electron theory in connection with adsorptions of electromagnetic radiation and anomalous skin effect. 89 ref. (P17)

217-P. Influence of Heat-Treatment on the Electrical Resistivity and the Thermal Conductivity of Electrodeposited Chromium. R. W. Powell and R. P. Tye. *Institute of Metals, Journal,* v. 85, Jan. 1957, p. 185-192.

The thermal and electrical conductivities of electrodeposited chromium are shown to increase as a result of heat treatment. A detailed investigation of the properties has been made over a wide range of temperatures and for heat treatment temperatures extending to 1410 °C.
(P11h, P15g, 2-14; *Cr,* 8-12)

218-P. Melting Point of Niobium. T. H. Schofield. *Institute of Metals, Journal,* v. 85, Apr. 1957, p. 372-374.

Experimental redetermination finds melting point of columbium samples containing 0.12% gaseous impurities and 1.9% tantalum is 2468 plus or minus 10° C.
(P12n; Cb)

219-P. Physical and Mechanical Properties of Niobium. C. R. Tottle. *Institute of Metals, Journal,* v. 85, Apr. 1957, p. 375-378.

Experimentally determined data on thermal expansion at elevated temperatures, thermal conductivity, electrical resistivity and tensile properties of columbium at room and elevated temperatures. Results of creep tests on columbium and a columbium alloy with 6¼% molybdenum at 600° C.; effect of oxygen and alloying elements on mechanical

properties and electrical resistivity at room temperature.
(P11, P15g, Q27a, Q3m, 1-11; Cb)

220-P. Magnetic Susceptibility of Alpha and Beta Brass. B. G. Childs and J. Penfold. *Philosophical Magazine,* v. 2, 8th Ser., Mar. 1957, p. 389-403.

Magnetic susceptibility has been measured at 77 and 300° K. of a series of copper-zinc alloys, ranging in composition from 0-47.6 at. % zinc, and of one silver-cadmium alloy containing 30.5 at. % cadmium. 19 ref. (P16n; Cu-n)

221-P. K Auger Yield for Tin. J. A. V. Fairbrother, D. G. Parkyn and B. M. O'Connor. *Physical Society, Proceedings,* Section A, v. 70, Pt. 4, Apr. 1, 1957, p. 262-274.

The principle employed by Martin and Stockmeyer in their determination of the fluorescent yield for gases is extended in the present paper to a determination of the fluorescent yield for metals. 18 ref. (P17; Sn)

222-P. Effect of Eddy Currents on Nuclear Magnetic Resonance in Metals. A. C. Chapman, P. Rhodes and E. F. W. Seymour. *Physical Society, Proceedings,* Section B, v. 70, Apr. 1, 1957, p. 345-360.

A theoretical and experimental investigation of this effect is described. The theoretical treatment is developed for specimens in the form of (*a*) a flat plate, (*b*) a long cylinder and (*c*) a sphere; and is applicable to foils, wires and powders with spherical particles. 16 ref. (P18m; 4-6, 4-11, 6-18)

223-P. Thermodynamic Properties of Titanium-Oxygen Solutions and Compounds. A. D. Mah, et al. *U.S. Bureau of Mines, Report of Investigations* 5316, Mar. 1957, 33 p. (CMA)

Among the thermodynamic data presented are heats of formation for rutile and titanium-oxygen interstitial solutions, low-temperature heat capacities and entropies, free energies of formation and high-temperature heat contents. (P12; Ti, O)

224-P. Effect of Radiation on the Thermal Conductivity of Uranium-1.6 w/o Zirconium. H. W. Deem, et al. *U.S. Atomic Energy Commission,* BMI-986, Mar. 16, 1956, 19 p. (CMA)

Fuel rods of uranium with 1.6% Zr are being considered for the sodium-cooled, fast-neutron power reactor. The thermal conductivity is important and was tested for rods which had been irradiated in the MTR by Argonne. Measuring was accomplished by the heat wave method. The reduction in thermal conductivity for 0.21 and 0.75 at. % burnup was 8 and 9.5%, respectively. (P11h, T11g, 17-7, 2-17; U, *Zr*)

225-P. Determination of Emissivity and Reflectivity Data on Aircraft Structural Materials. Pt. 1. Techniques for Measurement of Total Normal Emissivity and Reflectivity With Some Data on Copper and Nickel. H. T. Betz. Armour Research Foundation. (Wright Air Development Center.) *U.S. Office of Technical Services,* PB 121817, Oct. 1956, 51 p. $1.50.

Equipment was designed, constructed and calibrated for measurement of total normal emissivity in the range minus 300-3000° F. For the measurement, the total normal radiance of a sample is compared to that of a comparison black body, and the ratio of the signals is taken as the emissivity. Measurements were made of the total normal emissivity for copper and nickel. (P17a, P17d, T24, 17-7; Cu, Ni)

226-P. Electron Transport Properties of Dilute Binary Magnesium Alloys. E. W. Kammer. Naval Research Laboratory. *U.S. Office of Technical Services,* PB 121851, Dec. 1956, 19 p. $.50.

Demonstrates that measurements of electron transport properties of dilute magnesium alloys are sensitive to the Brillouin zone overlap phenomena deduced earlier by X-ray techniques. Matthiessen's rule and Linde's rule were found invalid. (P15p; Mg)

227-P. Semiconducting Intermetallic Compounds. L. Pincherle and J. M. Radcliffe. *Advances in Physics,* v. 5, July 1956, p. 272-322.

Review of the preparation, properties, theory and applications of so-called semiconducting intermetallic compounds. 145 ref. (P15g, A general; SGA-r)

228-P. Characteristics of Metal-Clad Laminates. D. S. Hoynes. *Electrical Manufacturing,* v. 59, Apr. 1957, p. 104-109, 352.

Tests were conducted on: (1) the current-carrying capacity of etched copper conductors; (2) resistance

measurements on samples having a variety of protective coatings; and (3) dielectric properties of a number of metal-clad laminates at various temperatures. (P15; Cu, 8-16)

229-P. Specific Heats of Some Metallic Elements. Pt. 1. Analysis of the Experimental Data. C. V. Raman. *Indian Academy of Sciences, Section A, Proceedings,* v. 45, Jan. 1957, p. 1-6.

Specific heat data in the temperature range from 15 to 300° reported by Giaque and collaborators for the four metals aluminum, copper, silver and lead are analyzed and the effective average frequency of the atomic oscillators deduced therefrom is plotted as a function of the temperature. 7 ref.
(P12r, 2-11; Al, Cu, Ag, Pb)

230-P. Specific Heats of Some Metallic Elements. Pt. 2. Approximate Theoretical Evaluation. C. V. Raman. *Indian Academy of Sciences, Section A, Proceedings,* v. 45, Jan. 1957, p. 7-14.

Specific heats of the four metals aluminum, copper, silver and lead which crystallize as face-centered cubic lattices are evaluated in terms of the four characteristic frequencies of vibration of such a lattice, these latter being determined by an approximate method which relates them to the elastic constants of the crystal. Results discussed and compared with the experimentally determined specific heats. 8 ref.
(P12r, 1-4; Al, Cu, Ag, Pb)

231-P. Quenching Vacancies in Gold. F. J. Bradshaw and S. Pearson. *Philosophical Magazine,* v. 2, 8th ser., Mar. 1957, p. 379-383.

Increases in the electrical resistivity of gold wires due to quenching measured and interpreted in terms of vacancies. The energy for vacancy formation was deduced to be 0.95 electron volt and the concentration of vacancies at the melting point 6 x 10^{-4}. Annealing measurements between 70 and 130° C. indicated that the movement energy of a vacancy was 0.68 electron volt and that it had on an average a life of 10^{8}-10^{9} jumps. 6 ref.
(P15g, M26s; Au)

232-P. Atomic Heat of Cerium Between 1.5° and 20° K. D. H. Parkinson and L. M. Roberts. *Physical Society Proceedings,* v. 70, May 1, 1957, p. 471-475. (CMA)

The specific heat of f.c.c. cerium between 1.5 and 20° K. shows a maximum at 12.5° K., the size of which increases with cooling time. The anomaly may be due to antiferromagnetism. 8 ref. (P12r; Ce)

233-P. Magnetic Susceptibility of Ytterbium From 1.3° K. to 300° K. J. M. Lock. *Physical Society Proceedings,* v. 70, May 1, 1957, p. 476-480. (CMA)

The magnetic susceptibility of ytterbium was measured at various temperatures. Only about 1/260th of the atoms are in the $^2F_{7/2}$ state (13 electrons in the 4f shell); the others are in the ^1S state. This is supported by the slight paramagnetic saturation effect at low temperatures.
(P16, 1-11; Yb)

234-P. Surface Tension of Binary Liquid Mixtures: Lead-Tin and Lead-Indium Alloys. T. P. Hoar and D. A. Melford. *Transactions of the Faraday Society,* v. 53, Pt. 3, Mar. 1957, p. 315-326.

Surface tensions of binary lead-tin and lead-indium alloys measured by an improved capillary method at temperatures ranging from the melting points to 550° C. Results compared with theoretical computations based on several previous equations, which are shown to be inadequate, and on a modified equation for a monolayer model of the surface of regular mixtures, which gives relatively good agreement with the experimental data. 22 ref. (P13h, 1-4; Pb, Sn, In)

235-P. Heat Transfer to Lead Bismuth in Turbulent Flow in an Annulus. R. A. Seban and D. F. Casey. University of Alabama. *U.S. Atomic Energy Commission,* AECU-3164, June 22, 1956, 16 p.

Heat transfer coefficients for molten lead-bismuth eutectic are presented for flow in annuli externally heated at a constant rate. Diameter ratios of 1.30 and 1.34 were investigated, and results were obtained for Peclet numbers from 400 to 1600. Results are shown to be related to analogy predictions for this system in the same manner as exist for pipe flow, and that the theories providing a rationalization of the results for pipe flow do so as well for the flow in an annulus. 8 ref. (P11k; Pb, Bi)

236-P. (French.) **Physical Adsorption on Raney Nickel.** Bernard Delmon and Jean-Claude Balaccaunu. *Comptes Rendus,* v. 244, Apr. 8, 1957, p. 2053-2056.

Raney nickel adsorbs physically in relatively large quantity the con-

stituents of the liquid phase with which it is in contact. This selective adsorption follows Langmuir's formula and has no connection with chemical adsorption studied by kinetic methods. 4 ref. (P13d; Ni)

237-P. (Italian.) **Silicon, Germanium and Selenium, Semiconductor Elements.** Giovanni Porro. *Industria Mineraria,* v. 8, Feb. 1957, p. 69-76.

Concept of conductor metals, of semiconductor metals; theories on the conductivity of the latter; applications of semiconductors. 16 ref. (P15g; Si, Ge, Se)

238-P. (Japanese.) **On the Change of Magnetic Properties Caused by Cold Drawing.** Shigeo Zaima and Zitsuya Shindo. *Japan Society of Mechanical Engineers, Transactions,* v. 23, Mar. 1957, p. 250-253.

The change of magnetic properties of the mild steel caused by cold working as an aid for analyzing the mechanism of improvement of properties. (P16, 3-18; CN)

239-P. (Book.) **Solid State Physics.** A. J. Dekker. 540 p. Apr. 1957. Prentice-Hall, Inc., 70 Fifth Ave., New York 11, N.Y. $9.

The book is presented in two parts, the first dealing essentially with topics which are discussed in terms of atoms with little or no reference to the electron theory of solids; the second dealing with the electronic properties of solids. It is intended as an introduction to the subject, and is directed to students of the senior undergraduate level.
(P general, M general, N general)

240-P. (Book.) **Introduction to Semiconductors.** W. Crawford Dunlap. 417 p. Apr. 25, 1957. John Wiley & Sons, Inc. 440 Fourth Ave., New York 16, N.Y. $11.75.

Unified elementary survey of the field, covering basic concepts, properties of materials, methods of measurement, applications. (P15)

241-P. Dynamic Magnetostrictive Properties of Ni-Fe Alloys. C. M. Davis, H. H. Helms and S. F. Ferebee. *Acoustical Society of America, Journal,* v. 29, Apr. 1957, p. 431-434.

The dynamic magnetostrictive properties of nickel-iron alloys containing from 35 to 67.5% nickel investigated to determine their suitability for use in electromechanical transducers. The materials, in the form of toroids made from ring laminations, were evaluated by the motional impedance method. Annealing temperatures were varied from 600 to 1220° C. and the effect of various annealing techniques was investigated. Measured values of the electromechanical coupling coefficient, the reversible permeability, the dynamic magnetostrictive constant, and other parameters. (P16b; Ni, Fe)

242-P. Pressure-Induced Metallic Transitions in Insulators. B. J. Alder and R. H. Christian. *Faraday Society Discussions,* no. 22, 1956, p. 44-46.

Experimental evidence is presented revealing that several ionic and molecular crystals change their conductivity into the range of metallic conductivities when subjected to a pressure of about 250,000 atm. For some of these substances the pressure at which this transition occurs is roughly defined. 6 ref. (P15g, M25, 3-24)

243-P. Nitric Acid Dissolution of Thorium. Kinetics of Fluoride-Catalyzed Reaction. Robert Lee Moore, C. A. Goodall, J. L. Hepworth and R. A. Watts. *Industrial and Engineering Chemistry,* v. 49, May 1957, p. 885-887.

The dissolution of thorium metal, or of thorium oxide, in nitric acid is the first step in the recovery of metallurgical scrap or in the chemical reprocessing of blanket material from breeder-type power reactors. The investigation was undertaken to obtain quantitative information on the rate of the reaction to determine the effect of the variables involved and to develop correlations which would aid general application. 4 ref. (P13b, A11d; Th, RM-p)

244-P. Some Properties of Certain High-Conductivity Copper-Base Alloys. Webster Hodge. *Journal of Metals,* v. 9, *AIME Transactions,* v. 209, Apr. 1957, p. 408-412.

Data on electrical conductivity, softening temperature on long-time exposure, hot hardness, tensile properties at room and elevated temperatures, stress-rupture properties for copper containing 0.2% zirconium or 0.8% chromium or 25 oz. of silver per ton.
(P15g, Q general; Cu, SGA-r)

245-P. Electronic Structure of Palladium-Uranium Alloys. J. A. Catterall. *Philosophical Magazine,* v. 2, 8th Ser., Apr. 1957, p. 491-498.

The measured effects of uranium upon the paramagnetic susceptibil-

ity, electrical resistivity, thermoelectric power, and lattice parameter of palladium; interpretation of the results in terms of a solvent and solute band is suggested. 14 ref. (P16p, P15g, M26; Pd, U)

246-P. Thermal Conductivity of Metals at Low Temperatures. Deviations From Ideal Behaviour. H. M. Rosenberg. *Philosophical Magazine,* v. 2, 8th Ser., Apr. 1957, p. 541-547.

Measurements of the thermal conductivity of single crystals of zinc and cadmium have been taken between 2 and 20° K. The results show that a plot of WT against T^3 (where W is the thermal resistance) instead of being a straight line, has linear sections at high and at low temperatures, the slope at high temperatures being about three times that at low temperatures. This behavior is shown to be connected with the very marked changes which occur in the values of the Debye temperature. 11 ref. (P11h, 2-13; Zn, Cd, 14-11)

247-P. Composition Vs. Hot Strength Diagram of the Alloys in the Nickel-Chromium-Titanium System. I. I. Kornilov and L. I. Pryakhina. *Henry Brutcher Translation* No. 3912, 8 p. (From *Izvestiya Akademii Nauk SSSR, OTN,* no. 7, July 1956, p. 103-110.) Henry Brutcher, Altadena, Calif.

Previously abstracted from original. See item 448-P, 1956. (P12, P15, M27, Q29; Ni, Cr, Ti)

248-P. (English.) **Electrochemistry of Metallic Single Crystals. Pt. I. Exchange Overvoltages on Silver and Copper.** R. Piontelli, G. Poli and L. Paganini. *Nuovo Cimento,* v. 5, no. 1, Apr. 1957, p. 1018-1019.

Anodic and cathodic behavior of single crystal surfaces having a well-defined orientation investigated. (P15; 14-11)

249-P. (German.) **Electrical Contacts and Contact Materials.** Horst Schreiner. *Zeitschrift für Metallkunde,* v. 48, Apr. 1957, p. 180-190.

Materials for electrical contacts (pure metals, alloys, cermets) discussed systematically on the basis of the general requirements for contacts. Some possible production improvements of known contact materials are suggested. 13 ref. (P15; SGA-r)

250-P. (Japanese.) **Investigation on Cast Iron Having Refined Graphite Produced by Melting Cast Iron Covered With Slag Containing TiO_2 (VI).** H. Sawamura and M. Tsuda. *Iron and Steel Institute of Japan, Journal,* v. 43, Apr. 1957, p. 471-480. (CMA)

Titanium is present in gray cast iron both in solid solution and in compounds (i.e., TiC, TiN, TiO, Ti_2O_3, TiO_2, TiO_3 and TiS); 80% of the titanium present in gray cast iron is TiC. Separation and determination procedures used are shown. The solubility of titanium and titanium compounds was tested in dilute and concentrated H_2SO_4 (hot and cold), HNO_3, HCl and aqua regia. Data on the influence of acid concentrations are tabulated. (P12e; CI, *Ti*)

251-P. Magnetic Properties and the Structure of Metals. W. Sucksmith. *British Journal of Applied Physics,* Supplement No. 6, Physics of Non-Destructive Testing 1957, p. S24-S27.

Study of magnetic properties which can be used as an indication of variation in composition and structure of metals. Consideration is given to new developments in magnetism which may have application in future. 9 ref. (P16, M27)

252-P. Principles and Applications of Nuclear Magnetic Resonance. L. E. Drain. *British Journal of Applied Physics,* Supplement No. 6, Physics of Non-Destructive Testing 1957, p. S27-S33.

In metals, nuclear resonance frequencies are shifted due to conduction electrons and this shift is related to the electronic structure of the metal. Distortion produced by impurities or mechanical treatment is often sufficient to broaden the magnetic resonance. Ordinarily reasonances lie in radio-frequency range and may be detected by radio techniques. 12 ref. (P16f)

253-P. Measurement of Elastic Constants by the Ultrasonic Pulse Method. M. F. Markham. *British Journal of Applied Physics,* Supplement No. 6, Physics of Non-Destructive Testing 1957, p. S56-S63.

Apparatus used and accuracy which may be achieved. Method may be applied to polycrystalline materials provided grain size is reasonably small. Crystal symmetry of various metals is discussed. (P21, 1-3, M26)

254-P. How Castings Hold Dimensional Stability. F. C. Benz. *Iron Age,* v. 179, May 16, 1957, p. 120-121.

Investigation on Meehanite in the as-cast, annealed and heat treated condition to determine degree of stability inherent in material over a period of seven years. (P10d; CI)

255-P. Electron-Spin Resonance and Magnetic-Susceptibility Measurements on Dilute Alloys of Mn in Cu, Ag and Mg. J. Owen, M. E. Browne, V. Arp and A. F. Kip. *Journal of Physics and Chemistry of Solids,* v. 2, Apr. 1957, p. 85-99.

An account of some magnetic measurments made on alloys of copper containing from 0.03 to 11 at. % Mn in the temperature range 2 to 400° K. Less detailed work on silver-manganese and magnesium-manganese also described. All of these alloys are found to obey a Curie-Weiss susceptibility law, and show an electron spin resonance line with free spin g-value. 8 ref.
(P16f; Cu, Ag, Mg, *Mn*)

256-P. Thermal and Electrical Resistivity of Tellurium at Low Temperatures. Gaston Fischer, G. K. White and S. B. Woods. *Physical Review,* v. 106, May 1, 1957, p. 480-483.

Measurements of the electrical and thermal resistivity between 2° K. and room temperature of high-purity tellurium rods prepared by zone refining are reported. The maximum thermal conductivity in the case of a single crystal of 3mm. diam. is about 10 watts per cm. at 4° K.; analysis of the measurements suggests that in the specimens used the thermal conductivity—due predominantly to lattice waves—is limited by scattering at grain boundaries or dislocations for temperatures below 4° K. and at higher temperatures (about 100° K.) by phonon-phonon interaction.
(P11h, P15g, 2-13; Te)

257-P. (German.) **On the Conductivities of Some Ferrous Materials.** Karl Lohberg and Jurgen Motz. *Giesserei,* v. 44, May 23, 1957, p. 305-308.

Communication from the Metal Laboratory of the Metallgesellschaft A.G., Frankfort. Manufacture of alloys; measuring thermal and electric conductivities; conclusions.
(P11h, P15g; CI, ST)

258-P. Effect of Solute Elements on Resistivity. C. R. Vassel. *Acta Metallurgica,* v. 5, June 1957, p. 350-351. (CMA)

An analysis of some 100 solute elements in five solvent metals reports work on alpha-titanium and it is concluded that increases in electrical resistivity may be related to differences in valence. A general analytical discussion is given which includes a note to the effect that there is no valence change with zirconium. (P15g; Zr)

259-P. Determination of the Surface Tensions of Molten Lead, Tin, and Indium by an Improved Capillary Method. D. A. Melford and T. P. Hoar. *Institute of Metals, Journal,* v. 85, Jan. 1957, p. 197-205.

An improved method for measurements up to about 1000° C. Molten metal is forced by measured differential gas (hydrogen) pressure to equivalent levels in two fused silica capillaries of different bore.
(P13h, 1-4; Pb, Sn, In)

260-P. Specific Heat and Resistivity of Mild Steel. P. R. Pallister. *Iron and Steel Institute, Journal,* v. 185, Apr. 1957, p. 474-482.

Spot method used for measurement of specific heat of low-carbon steel from room temperature up to 1000° C. in such a way as to avoid retention of unstable constituents. Includes thermal analysis at various rates of heating and cooling and observations on electrical resistance. 5 ref. (P12r, P15g; CN)

261-P. Surface Tension of Pure Liquid Iron, Cobalt and Nickel at 1550° C. Paul Kozakevitch and Georges Urbain. *Iron and Steel Institute, Journal,* v. 186, June 1957, p. 167-173.

Measurements were made by the sessile drop method. By control of atmosphere and use of pure oxide refractories, it was possible to obtain less than 0.001% dissolved oxygen in the drop. Preparation of samples, control of oxygen pressure in the furnace and use of refractories are described. All results of experimentally successful runs have been reported rather than selected or mean values, thus permitting better evaluation of dispersion. 19 ref.
(P13h; Fe, Co, Ni, 14-10)

262-P. Thermodynamic Properties of CS and Solutions of Sulfur in Carbon-Saturated Liquid Iron. C. J. B. Fincham and R. A. Bergman. *Journal of Metals,* v. 9, *AIME Transactions,* v. 209, May 1957, p. 690-694.

Study of equilibria at 1600 and 1800° C. between dilute solution of sulphur in carbon-saturated liquid iron and gas mixture consisting, in-

itially, of argon and CS_2. Results allowed calculation of the standard free energy of formation of gaseous CS and determination of equilibria sulphur pressures over the dilute solution of sulphur in liquid iron. 15 ref. (P12; Fe, *C, S*)

263-P. Effects of Radiation on Materials. Julius J. Harwood. *Metal Progress,* v. 71, June 1957, p. 72-74.

Changes in metallic properties by extreme radiation by neutrons and gamma rays are explainable by displacement of atoms in the crystalline lattice or introduction of new atoms (either fission products or transformed elements). Certain new organic substances of quasi-crystallinity have been produced by intense radiation.
(P general, Q general, M25, 2-17)

264-P. Tensile Properties of Porosity-Graded 195 Alloy. Irving J. Feinberg. *Nondestructive Testing,* v. 15, May-June 1957, p. 168-173.

Although hydrogen-gas porosity is known to have a detrimental effect on mechanical properties of aluminum alloys, little work has been published on quantitative effects of this defect. A radiographic classification procedure to obtain reliable porosity-grade assignments before assessing damage is described. The value of Aeronautical Technical Inspection Manual NAVAER-00-15PC-504 in classification is discussed. Quantitative determinations of damage to ultimate tensile strength, yield strength and per cent elongation attendant upon elongated hydrogen-gas porosity were obtained. Expected minimum properties for material containing seven degrees of porosity are presented.
(P10m, S13e, Q27a; Al)

265-P. Magnetic Properties of Alloys Having the Compositions Mn_{60} Al_x, Zn_{20-x} C_{20} and Mn_{60} Ga_x Zn_{20-x} C_{20}. L. Howe and H. P. Myers. *Philosophical Magazine,* v. 2, 8th Ser., Apr. 1957, p. 554-560.

Variation of Bohr magneton numbers with the composition in manganese - aluminum - zinc - carbon alloys and manganese-gallium-zinc-carbon alloys. 3 ref. (P17; Mg, SGA-n)

266-P. Thermal and Electrical Conductivities of Tungsten. Experimental Results on Single Crystals Compared With Theory. J. De Nobel. *Physica,* v. 23, Apr. 1957, p. 349-358.

Results of investigations of electrical and thermal conductivity of four tungsten single crystals are compared with theoretical considerations. From the relation between these conductivities at constant temperature as a function of field strength an estimation of the lattice conductivity is made.
(P11h, P15g; W, 14-11)

267-P. Magnetic Susceptibilities of Lanthanum, Cerium, Praseodymium, Neodymium and Samarium From 1.5° K. to 300° K. J. M. Lock. *Physical Society, Proceedings,* v. 70, June 1, 1957, p. 566-576. (CMA)

Measurements of magnetic susceptibility in the 1.5-300° K. range showed low-temperature anomalies in cerium, neodymium, and samarium at 12.5, 7.5 and 14.8° K., respectively. The metals are believed to be antiferromagnetic below these points. The laws obeyed by the susceptibilities of neodymium, cerium and praseodymium are presented.
(P16, 1-13; La, Ce, Pr, Nd, Sm)

268-P. How Metals Change by Irradiation. H. I. Raiklen. *Product Engineering,* v. 28, Apr. 1957, p. 168-169.

Irradiation effects on metals are large in some instances and negligible in others. Many variables coexist: type, intensity and dosage of radiation; type, purity and initial state of the material; character, temperature and pressure of the surrounding medium. Beneficial changes in bulk properties are not significantly different from those produced by conventional metallurgical methods.
(P general, Q general, 2-17)

269-P. Preliminary Studies of Irradiation Damage to Uranium-Zirconium Alloys. S. H. Paine and W. F. Murphy. *U.S. Atomic Energy Commission,* ANL-5537, Oct. 1956, 27 p. (CMA)

Adding zirconium to uranium fuel elements adds irradiation stability. A U-10% Zr alloy showed greater surface stability than unalloyed uranium. U-4.5 Zr also showed good stability and any tendency to dimensional change was restrained by a thin aluminum cladding, but burnup is relatively low. The fuel materials tend to fission-weld to zirconium.
(P18; T11g, 17-7, 2-17; U, *Zr*)

270-P. (English.) **On the Entropy of Solid and Liquid Metals.** G. Bore-

lius. *Arkiv För Rysik,* v. 11, no. 5, 1957, p. 421-427.

Connections between the potential part of the entropy and the changes of volume. 8 ref. (P12s; 14-10)

271-P. (French.) **Electrochemical Behavior of Arsenic. Potential-pH Diagram of the System As-H_2O at 25° C.** J. Van Muylder and M. Pourbaix. *Cebelcor Rapport Technique,* no. 46, Feb. 1957, 14 p.

Stability circumstances and formation of arsenic, its oxides and arsenates. Examination of the functioning and circumstances of electrodes of arsenic for the measurement of the pH and for the realization of potentiometric titrations. 19 ref. (P15, R1; As)

272-P. (French.) **Electrochemical Behavior of Zirconium. Potential pH Diagram of the System Zr-H_2O, at 25° C.** M. Maraghini, P. Van Rysselberghe, E. Deltombe, N. de Zoubov and M. Pourbaix. *Cebelcor Rapport Technique,* no. 45, Jan. 1957, 10 p.

Free enthalpy values, oxidation potentials, theoretical circumstances of corrosion, immunity and passivation of zirconium, considerations on the stability of different forms of oxides and hydroxides and curves of solubility as a function of the pH. 23 ref. (P15, R1; Zr)

273-P. (French.) **K Absorption Spectra of Palladium in the Pure Metal and in Pd-Au Alloys.** Chintamani Mande. *Comptes Rendus,* v. 244, Feb. 4, 1957, p. 747-749.

K discontinuity of palladium has been determined for first time. 5 ref. (P17e; Pd, *Au*)

274-P. (French.) **Magnetic Reluctance of Thin Films of Bismuth.** Pierre Huet and Antonie Colombani. *Comptes Rendus,* v. 244, Mar. 18, 1957, p. 1626-1629.

Note on transverse reluctance when magnetic field is perpendicular to the flow of current. (P16; Bi, 14-12)

275-P. (French.) **Interaction Between One Surface of a Transparent Film of Nickel Obtained by Evaporation and Adsorbed Xenon Atoms.** R. Suhrmann, Von E. A. Dierk, B. Engelke, H. Hermann and K. Schulz. *Journal de Chimie Physique,* v. 54, Jan. 1957, p. 15-18, 45.

Photo-electric measurement of electron extraction and electrical resistance variations during adsorption of xenon under conditions of low pressure and low temperature. 9 ref. (P13d, P15; Ni, *Xe*)

276-P. (French.) **Adsorption of Hydrogen Atoms and Molecules on Platinum.** J. C. P. Mignolet. *Journal de Chimie Physique,* v. 54, Jan. 1957, p. 19-26, 45.

Adsorption of hydrogen on platinum studied at 190 and 20° C., chiefly by measuring surface potential. Less concentrated films are essentially atomic and present a negative surface potential. In highly concentrated films, hydrogen appears chiefly in form of molecules. Molecular adsorption is positive and surprisingly stable, with maximum heat differential of adsorption being about 15 K-cal. per mole. These results, obtained with platinum specimens prepared by evaporation, are contrary to those obtained with platinum sheet. It is probable that the latter results do not hold good for PtH film. 20 ref. (P13d, N16m; Pt, *H*)

277-P. (French.) **Polarity of the Chemisorptive Bond. Measurements of Surface Potential and Conductivity on Evaporated Metallic Film.** W. M. H. Sachtler and G. J. H. Dorgelo. *Journal de Chimie Physique,* v. 54, Jan. 1957, p. 27-36.

Specimens of nickel and tantalum foil were prepared by evaporation under strict vacuum conditions and their electronic extraction potentials and conductivity were measured before, during and after adsorption of a pure gas. Study of the surface potentials obtained leads to conclusion that the chemisorptive bond of the systems studied is of the "covalent" type and slightly polarized. An approximate equation gives surface potential in terms of extraction potential of the absorbing metals and the electronegativity of the adsorbed gas. 52 ref. (P13d, N16m; Ni, Ta)

278-P. (French.) **Emission of Electrons by Metallic Surfaces Following Mechanical Working.** H. Raether. *Journal de Chimie Physique,* v. 54, Jan. 1957, p. 48-52.

A mechanically worked metallic surface presents an emission of electrons which is a function of time. Study with help of a multiplier device to detect electrons shows that there are at least two possibilities of producing an emission of electrons: by disturbance of the lattice;

by reaction of the exposed surface to oxygen. (P15k)

279-P. (French.) **Study of Adsorption of Certain Gases on Copper.** F. Bloyaert, D'Or and J. Mignolet. *Journal de Chimie Physique,* v. 54, Jan. 1957, p. 53-57.

Preparation of copper surface by vacuum evaporation; measurement of surface potentials of films of xenon, nitrogen, hydrocarbons, carbon monoxide, oxygen, molecular and atomic hydrogen; vibrating condenser and thermo-electronic methods were used. 8 ref.
(P13d, N16m; Cu)

280-P. (French.) **Optical Properties of Thin Films of Palladium.** Damien Malé and Jean Trompette. *Journal de Physique et le Radium,* v. 18, Feb. 1957, p. 128-130.

New method permits simultaneous determination of optical constants and film thickness by measuring reflection and transmission factors. In some cases phases can be determined. 8 ref.
(P17a, P17c; Pd, 14-12)

281-P. (French.) **Secondary Electronic Emission Effected by Impact of Sodium Ions on Metal Test Pieces Under Strain Conditions.** P. Goutte and C. Guillaud. *Journal de Physique et le Radium,* v. 18, Mar. 1957, p. 202-203.

Source of ions; experimental apparatus and results obtained. Incomplete results tend to confirm that the increased emission provoked by strain results if the primary bombardment is of an ionic nature. 5 ref. (P15k, 3-18)

282-P. (German.) **Heat Exchange in Regenerators.** Jindrich Spal. *Neue Hütte,* v. 2, Apr. 1957, p. 234-245.

Heat exchange in regenerators, a stabilized periodic process; plate contained in a medium with a sinusoidally variable temperature in the time; generalization extended to any periodic temperature changes; heat exchange in the regenerator in the case of a gas flow. 4 ref.
(P11k, S18)

283-P. (German.) **Thermo-Electric Force Changes of Germanium Single Crystals at Low Temperatures.** J. Erdmann, H. Schultz and J. Appel. *Zeitschrift für Natürforschung,* v. 12a, Feb. 1957, p. 171-174.

The differential thermo-electric force of germanium remains relatively constant between room temperature and the boiling point of liquid air. At lower temperatures an increase in the thermo-electric force is found which reaches its maximum at the temperature of liquid hydrogen. 8 ref.
(P15p, 1-13; Ge, 14-11)

284-P. (Japanese.) **Investigation on Cast Iron Having Refined Graphite Produced by Melting Cast Iron Covered With Slag Containing TiO_2. Pt. VII. Thermodynamic Study on the Ti Contained in S-H Cast Iron.** H. Sawamura, T. Mori and M. Tsuda. *Iron and Steel Institute of Japan, Journal,* v. 43, May 1957, p. 560-564. (CMA)

The reactions $Ti + C \rightleftarrows TiC(s)$ and $Ti + N \rightleftarrows TiN(s)$ were studied thermodynamically for cast iron with 4% C, 0.25% Ti, 0.008% N, 0.03% S and 0.002% O. Formation temperatures were obtained also for TiO_2, TiO and TiS. The results are inaccurate but an idea was formed of the behavior of titanium in the melt during slow cooling from 1800° C.
(P12, E25; CI, *Ti*)

285-P. Low Temperature Resistivity of the Transition Elements: Cobalt, Tungsten, and Rhenium. G. K. White and S. B. Woods. *Canadian Journal of Physics,* v. 35, May 1957, p. 656-665.

Experimental values are reported for the electrical resistivity from 1.5 to 300° K., and for the thermal resistivity from 2 to 120° K., of high-purity cobalt, tungsten and rhenium. The temperature variation of the components of the electrical and of the thermal resistance due to scattering by thermal vibrations is deduced and the possible evidence for the importance of s-d transitions is discussed briefly. The temperature of the superconducting transition in samples of rhenium is found to be close to 1.70° K. 35 ref.
(P15g; Co-a, W-a, Re-a)

286-P. Specific Heats of Some Metallic Elements. Pt. 4. The Residual Spectrum. C. V. Raman. *Indian Academy of Sciences, Proceedings,* v. 45, Mar. 1957, p. 139-146.

Theoretical calculation of the specific heats of aluminum, copper, silver and lead with temperature in the vicinity of absolute zero. Calculated specific heats are in satisfactory accord with experimental results. 9 ref.
(P12r; Al, Cu, Ag, Pb)

287-P. Thermodynamics of the Zr-ZrO_2 System: The Dissociation Energies of ZrO and ZrO_2. W. A. Chupka, J. Berkowitz and M. G. Inghram. *Journal of Chemical Physics,* v. 26, May 1957, p. 1207-1210. (CMA)

The mass spectrometry of zirconium and/or ZrO_2 vapors was used to determine the vapor pressures, and hence the heats of sublimation. These data are tabulated and yield 7.8 ev and 14.5 ev for the dissociation energies of ZrO and ZrO_2, respectively. (P12q, P12c; Zr)

288-P. Relationship Between the Surface Tension of Liquid Chromium-Nickel Alloys and Some Properties in the Solid State. O. S. Bobzova and A. M. Samarin. *Metal Progress,* v. 72, July 1957, p. 178-182. (Digest from *Isvestiya Akademii Nauk S.S.S.R.,* No. 2, Feb. 1954, p. 52-59.)

Previously abstracted from original. See item 549-P. 1954. (P13k, Q29, Q6; Cr, Ni)

289-P. Electrical Properties of Thin Metal Films. Jacob Riseman. *New York Academy of Sciences, Transactions,* v. 19, Apr. 1957, p. 503-514.

Chromium films were prepared by the vacuum evaporation method. Initial results could be represented by a curve in which the average temperature coefficient of resistance, between 25 and 105° C., varied continuously with the electrical resistance. The temperature coefficient varied from about $+ 150 \times 10^{-6}$ per ° C. to $- 400 \times 10^{-6}$ per ° C. over the resistance range of 100 to 2000 ohms per sq. mm. 14 ref. (P15g; Cr, 14-12)

290-P. On the Surface Free Energy and Specific Heat of a Metal. R. Stratton. *Philosophical Magazine,* v. 2, May 1957, p. 702-704.

Calculations on the surface contributions to the lattice and free electron specific heats of metals. (P12r, P12a)

291-P. Magnetic Saturation in Alloys of Neodymium at Low Temperatures. J. M. Lock. *Philosophical Magazine,* v. 2, June 1957, p. 726-732. (CMA)

Magnetization of Nd-La alloys measured. Above 15° K. the susceptibility is field dependent and obeys the Curie-Weiss law. Saturation effects are shown at lower temperatures. A model is proposed on the basis of ferromagnetic and antiferromagnetic behavior. (P16, 2-13; Nd, La)

292-P. Specific Heats and Magnetic Susceptibilities of Alloys of Cerium With Lanthanum at Low Temperatures. L. M. Roberts and J. M. Lock. *Philosophical Magazine,* v. 2, June 1957, p. 811-819. (CMA)

Specific heat measurement of Ce-La alloys in the 1.5-20° K. range and magnetic susceptibility measurements in the 1.5-290° K. range are reported. The specific heat of cerium shows a single anomaly at 12.3° K. which splits into two for the alloys. The movements of these anomalies on the temperature scale with changes in composition are described. Antiferromagnetism is considered as an explanation. (P12r, P16; Ce, La)

293-P. Magnetic Properties of Neodymium Single Crystals. D. R. Behrendt, S. Legvold and F. H. Speeding. *Physical Review,* v. 106, May 15, 1957, p. 723-725. (CMA)

Single crystals of neodymium were measured magnetically at 20.4° K. and higher. The susceptibility is higher when the field is perpendicular to the c axis rather than parallel. No anisotropy was observed at the basal plane here, but at 4.2° K. magnetic anisotropy was observed and anti-ferromagnetic ordering is indicated. (P16; Nd, 14-11)

294-P. Theory of a New Apparatus for Determining the Thermal Conductivities of Metals. S. T. Hsu. *Review of Scientific Instruments,* v. 28, May 1957, p. 333-336.

The principle of transient temperatures inside a semi-infinite solid is applied to two identical sets of composite plates. Each of these sets consists of a standard specimen of a certain metal whose properties are known and a test specimen of a metal whose thermal diffusivity is to be determined. When these two sets, initially at different but constant temperatures, are brought into contact with each other, the transient temperature at the contact plane between the test and standard specimens corresponding to a certain time is measured, then the coefficient of thermal diffusivity of the tests specimen can be computed. (P11h, P11m, 1-3)

295-P. Reduction of Irradiation Damage to Uranium by Small Zirconium Additions. Interim Report. S. Untermyer. *U. S. Atomic Energy Com-*

mission, ANL-4604, Mar. 27, 1951, 5 p. (CMA)

The presence of some alloy additions reduces the irradiation damage to uranium in thermal reactors, but such diluents are not permissible in fast breeders or natural uranium reactors. The effects of small additions of zirconium were investigated (up to 10%) since it scatters fast neutrons well. Zirconium foils were tightly welded to U^{238} and U^{235} wafers; only slight irradiation damage was shown. The unprotected U^{235} control sample showed heavy pimpling.
(P18, W11p, 17-7, 2-17; U, *Zr*)

296-P. Effects of Postirradiation Annealing of Uranium-Zirconium Alloys. W. W. Johnston. *U. S. Atomic Energy Commission*, KAPL-1562. May 5, 1956. 19 p. (CMA)

Specimens of an 8% enriched U-Zr alloy which had been irradiated to the maximum were vacuum annealed at 425, 510 and 595° C. Densities and the amount of Zr^{85} released were determined as a function of time and temperature up to 500 hr. Specimens were all stable at 425° C. but volume increases of 15% were obtained at 595°C. The time dependence of gas release differed among various temperatures. 7 ref.
(P10a, J23, 1-23, 2-17; U, *Zr*)

297-P. (English.) **Magneto-Resistance at Low Temperatures and the Mean Free Path in Metals.** D. K. C. MacDonald. *Bulletin de l'Institut International Du Froid* (International Institute of Refrigeration), Supplement, Annexe 1956-2, Sept. 1956, p. 15-21.

The application of a magnetic field to a metal at constant temperature produces two well known effects when an electric current is passed through the metal. An electric field is generated (the Hall field) whose direction is perpendicular to the plane containing the applied magnetic field and the electric current, and secondly the resistance of the metal is found to increase (magneto-resistance effect). Essentially, the role played by the Hall field is to tend to balance the Lorentz force of the magnetic field acting on the moving charge-carriers and thus to tend to restore the unperturbed direction of current flow. (P16b, 2-13)

298-P. (English.) **Electrical Resistance and the Purity of Metals.** G. J. van den Berg. *Bulletin de l'Institut International Du Froid* (International Institute of Refrigeration) Supplement, Annexe 1956-2, Sept. 1956, p. 31-37.

From the results of measurements it is concluded that an absolute purity scale of metals cannot be based on the measurements of the residual resistance of single crystals and polycrystalline wires. 28 ref.
(P15g, 14-11)

299-P. (English.) **Peculiarities of the Temperature Dependence of the Electrical Resistance of Ferromagnetic Metals at Low Temperatures.** A. I. Sudovtsov and E. E. Semenenko. *Soviet Physics JETP*, v. 4, May 1957, p. 592-593. (Translated by American Institute of Physics.)

Peculiarity is brought about by the collisions of the conduction electrons with the carriers of ferromagnetism. Measurements were carried out on polycrystalline samples of iron, nickel and platinum in the temperature interval from 4.2 to 1.23° K. Platinum was chosen for comparison of the ferromagnetic metals with a metal of the transition group that was nonferromagnetic.
(P15g, 2-13; Fe, Ni, Pt)

300-P. (French.) **Properties of Pure Aluminum.** G. Chaudron. *Bulletin de l'Institut International Du Froid* (International Institute of Refrigeration) Supplement, Annexe 1956-2, Sept. 1956, p. 39-40.

The measurement of electric conductivity at low temperatures was particularly useful for following the purification of aluminum by the zone melting method. The measurement of residual resistance at liquid helium temperatures is a purity criterion when the metal is perfectly recrystallized. The electric conductivity method at low temperatures enables a thorough study of the recrystallization of aluminum starting from the cold worked state. It is also possible to study the imperfections of metals by this method. (P15g, N5, 2-13; Al-a)

301-P. (French.) **Influence of the Recrystallization of Aluminum on the Electrical Conductivity at Low Temperatures.** P. N. Albert. *Bulletin de l'Institut International Du Froid* (International Institute of Refrigeration), Supplement, Annexe 1956-2, Sept. 1956, p. 41-49.

New aluminum obtained by the zone refining method provides clear evidence of recrystallization at low temperatures. Aluminum studied had a purity degree of 99.999% at

temperatures between 50° C. and room temperature. The electrical conductivity at low temperatures is a very sensitive method for following the evolution of the structure of a metal. 5 ref.
(P15g, N5, 2-12; Al-a)

302-P. (French.) **Measurements on the Electrical Conductivity at Low Temperatures of Very Pure Aluminum Samples.** M. Caron. *Bulletin de l'Institut International Du Froid* (International Institute of Refrigeration) Supplement, Annexe 1956-2, Sept. 1956, p. 51-62.

Studies the relationship between electrical resistivity at low temperatures and the degree of purity of aluminum samples refined by the molten zone refining method and perfectly recrystallized by prolonged annealing. 6 ref. (P15g, 2-13; Al-a)

303-P. (French.) **Study of the Elimination of Lacunae in Very Pure Aluminum.** M. Wintenberger. *Bulletin de l'Institut International Du Froid* (International Institute of Refrigeration) Supplement, Annexe 1956-2, Sept. 1956, p. 71-75.

At the boiling point of liquid hydrogen (20.4° K. at 760 mm.) the electrical resistivity of aluminum is very sensitive to the presence of physical imperfections in the lattice of the metal. The elimination of lacunae at room temperature by following the evolution of electrical resistivity at 24.4 was studied. Two processes were used to introduce the lacunae in the metal lattice; tempering starting from temperatures near the melting point and plastic deformation. (P15q, M26, 2-13; Al-a)

304-P. (French.) **Changes in Magnetization of Nickel Caused by Adsorbed Films.** J. J. Broeder, L. L. Van Reijen and A. R. Korwagen. *Journal de Chimie Physique,* v. 54, Jan. 1957, p. 37-44.

Adsorption of hydrogen, ethylene and acetylene causes the magnetic moment of nickel to decrease. No effect was noted for nitrogen, while oxygen decreases the magnetic moment. 13 ref. (P16; Ni)

305-P. (French.) **Optical and Electrical Study of Bismuth Tellaride, Bi_2Te_3.** J. Lagrenaudie. *Journal de Physique et le Radium,* Supplement to No. 3, v. 18, Mar. 1957, p. 39A-40A.

Bismuth telluride is prepared by comelting components and refining by zone melting process. 10 ref.
(P15, P17, C28k; Bi, Te)

306-P. (Japanese.) **Aluminum and Aluminum Alloys for Electrical Conductors.** Kenkich Kamagi. *Japanese Journal of Metals,* v. 27, June 1957, p. 443-448.

Comparison of electric conductivity, tensile strength, thermal conductivity, melting point and elongation of aluminum wire, hard copper wire, copper wire and silmalec wire. Relation of electric conductivity of aluminum wire to its impurities; applications of aluminum wire. 36 ref.
(P15g, P11h, P12n, Q27a; Al, SGA-r)

307-P. (Japanese.) **Aluminum Foil and Its Applications.** Namio Kawashima. *Metals,* v. 27, June 1957, p. 454-458.

Physical, chemical and mechanical properties of aluminum foil at different thicknesses (0.0005 to 0.005 in.) Methods of manufacture and applications.
(P general, Q general, 17-7; Al, 4-6)

308-P. Performance of Magnetostrictive Transducers Made of Aluminum-Iron Alloy or Nickel-Copper Ferrite. Yoshimitsu Kikuchi. *Acoustical Society of America, Journal,* v. 29, May 1957, p. 569-573.

Specifications for the melting and rolling processes; factors affecting the magnetostriction characteristics; improvement of transduction efficiency. It is concluded that no other material which has larger coupling factor than that of nickel or "Alfer" (the 13.5% Al-Fe alloy), is necessary, insofar as the transducers to be used at their resonance are concerned. Improvement in the efficiency can be attained only by the considerable elimination of the eddy current, and this is accomplished by several magnetostrictive transducers made of Ni-Cu ferrites which are shown to be excellent for generating underwater ultrasound.
(P10; Al, Ni, Cu)

309-P. Electrical and Thermal Conductivity of Some Brasses at Low Temperatures. W. R. G. Kemp, P. G. Klemens, R. J. Tainsh and G. K. White. *Acta Metallurgica,* v. 5, June 1957, p. 303-309.

Copper-zinc alloys with up to 30% Zn were measured over wide range of temperatures and the lattice component of thermal conductivity deduced. Lattice conductivity at all temperatures was markedly increased by annealing. 19 ref.
(P11h, P15g, 2-13; Cu-n)

310-P. Thermal Changes in Steels as Shown by Resistivity. G. Bullock.

Iron and Steel, v. 30, June 1957, p. 280-283.

Experimental method for obtaining precise resistivity values. Numerical consistency of results obtained is commensurate with performance factors of the apparatus. Method is tedious and involves intricate apparatus compared with common inverse rate thermal techniques. (P11, P15g, 1-3)

311-P. Specific Heat and Resistivity of Mild Steel. P. R. Pallister. *Iron and Steel,* v. 30, June 1957, p. 290-294.

Measurements were made from ordinary temperatures up to 1000° C. by the "spot" method. Electrical resistivity entered incidentally into the calculation of specific heat. (P12r, P15g; CN)

312-P. Electrical Resistivities and Phase Transformations of Lanthanum, Cerium, Praseodymium, and Neodymium. F. H. Spedding, A. H. Daane and K. W. Herrmann. *Journal of Metals,* v. 9, July 1957, p. 895-897. (CMA)

The observed transformation points were confirmed by X-ray diffraction. Discrepancies between the heating and cooling curves of cerium are due to temperature fluctuations during the cooling measurements. (P15g, N6p; La, Ce, Pr, Nd)

313-P. p-n Junctions in Silicon and Germanium: Principles, Metallurgy, and Applications. G. C. Dacey and C. D. Thurmond. *Metallurgical Reviews,* v. 2, no. 6, 1957, p. 157-193.

Principles of electronic behavior of semiconductors, the importance of impurity distribution and p-n junctions and their applications as diodes and transistors; discusses phases giving phase diagram and distribution coefficients whereby impurities acting as donors and acceptors may be introduced into germanium and silicon crystals from liquid phase by freezing or by diffusion. Techniques for the controlled distribution of impurities by freezing and diffusion are reviewed in detail. 89 ref. (P15; Ge, Si, 9-1)

314-P. Thermal and Electrical Conductivity of Chromium at Low Temperatures. A. F. A. Harper, W. R. G. Kemp, P. G. Klemens, R. J. Tainsh and G. K. White. *Philosophical Magazine,* v. 2, May 1957, p. 577-583.

Electrical and thermal conductivities have been measured over a wide range of temperature of specimens of pure chromium, both in the ductile and embrittled states. It has been found that the low-temperature conduction properties are very similar to those of other transition metals investigated. At low temperatures the electrical resistance is mainly due to the scattering of electrons from the s-band to the d-band while (s-s) scattering contributes about 60% of the thermal resistance. 15 ref. (P11h, P15g, 2-13; Cr-a)

315-P. Magnetization of Cobalt-Manganese and Cobalt-Chromium Alloys. J. Crangle. *Philosophical Magazine,* v. 2, May 1957, p. 659-668.

Magnetization measurements on the hexagonal and the face-centered cubic phases in several ferromagnetic cobalt-rich alloys in these systems have been made. By the use of suitable extrapolation procedures, the magnetic moments of both phases in each system at the absolute zero have been estimated. In the cobalt-manganese alloys there is a significant difference in the dependence of moment on composition between the two phases. This is not the case in the cobalt-chromium alloys, where the rate of change of moment with composition of both phases is the same. 8 ref. (P16; Co, *Mn, Cr*)

316-P. Anodic Overpotential for Oxide-Free Zirconium. M. Maraghini, G. B. Adams, Jr., and P. Van Rysselberghe. *U. S. Atomic Energy Commission,* AECU-3467, May 1, 1957, 12 p. (CMA)

An application of the method of estimating oxide film thickness on zirconium from potential measurements is described, namely the estimation of the potential that a polarized zirconium anode would show if it were free of oxide film. The equations basic to the theory are expressed; experimental results are described. (P15, 1-3, R1-h; Zr)

317-P. Thermal Conductivity of 347 Stainless Steel and Zirconium. L. R. Vianey. Massachusetts Institute of Technology, N5 ori-07827, NR 035-267, *U. S. Office of Technical Services,* PB 123-175, Feb. 1951, 6 p. (CMA)

Thermal properties of zirconium and of stainless 347. (P11h; SS, Zr)

318-P. X-Ray Emission Spectra of Mn and Cu in a Heusler Alloy at Temperatures Around the Curie Point. E. E. Vainshtein and B. I. Kotliar. *Soviet Physics "Doklady",* v. 1, no. 5,

p. 527-529. (Translated by American Institute of Physics Inc.)

Effect of the magnetic state of a substance on the X-ray spectra of its constituent elements. The shape and position of the lines of the K_B group of manganese and copper in an alloy which was close in composition to Cu_2Mn-Al and the corresponding characteristics of the $K\alpha_{1,2}$ lines of the same elements in a broad temperature range were investigated. 9 ref.
(P17e, P16d;Mn, Cu)

319-P. Magnetoresistance and Hole Conduction in Tellurium. S. S. Shalyt. *Soviet Physics "Doklady"*, v. 1, no. 4, p. 488-489. (Translated by American Institute of Physics, Inc.)

An investigation of magnetoresistance in tellurium at the temperature of liquid helium ($T \leq 4.2°$ K.) shows that the valence band of tellurium is split into two energy bands of different widths; in terms of the theory of electrical conductivity of solids this indicates that tellurium contains two groups of hole carriers of different mobility.
(P15g, P16e; Te)

320-P. (English.) **Thermal Conduction and Heat Capacity of Dilute Silver Alloys at Low Temperatures.** J. De Nobel. *Bulletin de l'Institut International Du Froid* (International, Institute of Refrigeration), Supplement, Annexe 1956-2, Sept. 1956.

Results of measurements of the thermal conduction of dilute silver alloys (with 0.14, 0.32 and 0.55% manganese and 0.24% indium) carried out in intense magnetic fields up to 25 Ko are reported. 27 ref.
(P11h, P12r, 2-13; Ag)

321-P. (English.) **Electrical Resistivity and Hall Coefficient of PbTe Crystals.** Kisaburo Shogenji and Susumu Uchiyama. *Physical Society of Japan, Journal,* v. 12, Mar. 1957, p. 252-258.

The electrical resistivity and Hall coefficient of p-type synthetic lead telluride crystals and those after heat treatment in the air were measured at various temperatures down to liquid air temperature. After heat treatment at moderate temperature in the air the resistivity and Hall coefficient of the crystals increased. 16 ref. (P15g; Pb, Te)

322-P. (French.) **Measurements on the Magnetic Susceptibility of Germanium.** W. Duchateau and A. Van Itterbeek. *Bulletin de l'Institut International Du Froid* (International Institute of Refrigeration), Supplement, Annexe 1956-2, Sept. 1956, p. 83-89.

Measurements were made on the susceptibility of seven samples of germanium obtained from single crystals of very pure germanium or of germanium containing small amounts of Sb (10^{14}, 10^{17}). The measurements were carried out between room temperature and liquid helium temperatures. For the pure samples an increase was found of the diamagnetic susceptibility of about 5% between room temperature and liquid hydrogen temperatures. In the liquid helium region the susceptibility was nearly constant.
(P16, 2-13; Ge, 14-11)

323-P. Investigation in Non-Aqeous Solvents. Pt. 2. Solubility and Conductances of Some Rare Earth Metal and Thorium Acetates in Ethylenediamine. T. Muniyappan and B. Aanjaneyalu. *Indian Academy of Sciences, Proceedings,* v. 45, no. 6A, June 1957, p. 412-417. (CMA)

Lanthanon acetate solubilities and conductances in anhydrous ethylenediamine studied as a preliminary to electro deposition studies at low temperature. Only cerous and lanthanum ions are soluble and conductances show the behavior of weak electrolytes. 11 ref.
(P15g; EG-g, Th)

324-P. Effect of Quenching on Thermal Conductivity and Electrical Resistivity. R. W. Powell. *Iron and Steel,* v. 30, June 8, 1957, p. 283-285.

Electrical resistivities and thermal conductivity of oil quenched and water quenched steels.
(P11h, P15g, 2-14, ST)

325-P. Effect of Oil Quenching and Tempering on Thermal Conductivity and Electrical Resistivity. R. W. Powell and R. P. Tye. *Iron and Steel,* v. 30, June 8, 1957, p. 285-288.

Thermal conductivity and electrical resistivity for a high-carbon, chromium-molybdenum steel and for an En8 and En19 steel.
(P11h, P15g, 2-14; ST)

326-P. Low-Temperature Reactor Irradiation Effects in Metal. T. H. Blewitt, R. R. Coltman, C. E. Klabunde and T. S. Noggle. *Journal of Applied Physics,* v. 28, June 1957, p. 639-644.

Effects of structural and chemical defects on 30-50° K. annealing peak in aluminum and copper. It is suggested that a defect similar to a crowdion must be created by low-

temperature neutron irradiation. Experiments also preclude vacancy-interstitial annihilation.
(P18h, 2-17)

327-P. Magnetostriction of Aluminum-Iron Single Crystals in the Region of 6 to 30 Atomic Percent Aluminum. R. C. Hall. *Journal of Applied Physics,* v. 28, June 1957, p. 707-713.

Measurement and evaluation of spontaneous saturation magnetostriction and forced magnetostriction on slowly cooled single crystals of ferromagnetic aluminum-iron alloys. (P16b; Fe, *Al,* 14-11)

328-P. Resonance Absorption of Neutrons by Thorium Cylinders. Monte V. Davis. *Journal of Applied Physics,* v. 28, June 1957, p. 714-716.

Measurement of resonance integral and determination of Doppler coefficients. (P18m; Th)

329-P. High Conductivity Copper Alloys. *Metal Industry,* v. 90, June 21, 1957, p. 522 and 526.

Electrical conductivity, softening temperatures and mechanical properties of copper containing 0.25% zirconium. (P15g; Cu, *Zr*)

330-P. Mystery of Magnetic Annealing. J. J. Becker. *Metal Progress,* v. 72, Aug. 1957, p. 84-89.

Properties of some magnetic alloys are improved by annealing in a magnetic field. In age hardening alloys this may be due to growth of needle-like particles aligned by the magnetic field; in solid solutions "ordered" particles may grow in similar shapes, or atom-pairs may be aligned with the field.
(P16, J23; SGA-n)

331-P. Superconducting Properties of Rhenium, Ruthenium and Osmium. J. K. Hulm and B. B. Goodman. *Physical Review,* v. 106, May 1957, p. 659-671.

Influence of various methods of specimen preparation and treatment on superconductivity. Results reinforce conclusions that behavior is a result of specimen preparation and not a fundamental property of the group. (P15g; Re, Ru, Os)

332-P. Electrical Resistivity of Au_3Cu at Low Temperatures. Hiroshi Sato. *Physical Review,* v. 106, May 1957, p. 674-675.

Temperature-resistivity curves from liquid helium temperature to room temperature were measured on quenched specimen as well as on specimens annealed for different lengths of time at 185° C. Debye temperature of ordered state was found to be lower than that of disordered state, which is contrary to results for Cu_3Au. 4 ref.
(P15g, 2-13; Au, Cu)

333-P. Paramagnetic Effect in Superconductors. Pt. 4. Measurements on Aluminum. A. H. Fitch and Hans Meissner. *Physical Review,* v. 106, May 1957, p. 733-736.

By means of a cryostat, operating down to 0.9° K., paramagnetic effect of polycrystalline and single crystal pure aluminum was observed. Behavior of polycrystalline sample conformed with that observed in other superconductors; however, Ig value was below 0.6 amp., thereby indicating Ig values do not necessarily occur in multiples of 0.6 amp. as suggested from measurements of other superconductors.
(P16p, P15g; Al)

334-P. Development of Dimensionally Stable Uranium Alloys. F. R. Shober, L. L. Marsh and G. T. Muehlenkamp. Battelle Memorial Institute, *U. S. Atomic Energy Commission,* BMI-961, Oct. 26, 1954, 37 p.

Results of an effort specifically directed toward increasing the dimensional stability of alpha-rolled, alpha-annealed uranium by alloying. Additional data on many of the alloys which describe the effect of beta and gamma-phase heat treatments on the dimensional stability during thermal cycling are also presented. (P10d, 2-11, 2-14; U)

335-P. Thermal Distortion of SAR Reactor Hafnium Control Rod. W. H. Goldthwaite, C. M. Allen and S. L. Fawcett. *U. S. Atomic Energy Commission,* BMI-1099, June 27, 1957, 18 p. (CMA)

A study of the thermal distortion of a Y-shaped hafnium control rod showed that the radiation heating method employed is suitable for such testing. The large axial and radial temperature gradients specified were met. The distortion amounted to a 2-mil. movement of the free end of the rod in the direction of the coolest blade.
(P10d, T11j, 17-7; Hf)

336-P. Impurities in Semiconductors. J. H. Scaff. Lecture No. 4 of "Effect of Residual Elements on the Properties of Metals." American Society for Metals, p. 88-132.

Role of impurities and impurity distribution in preparation of semiconductor devices and chemical and metallurgical procedures whereby desired distributions are obtained. 39 ref. (P15g, 3-19)

337-P. Electrical Conductivity of Uranium. Karl F. Smith. Argonne National Laboratory, *U. S. Atomic Energy Commission,* ANL-5700, Part B, Apr. 1957, 25 p.

Data on electrical conductivity of uranium, including British work on purity, study of transition temperature effects and other unusual points such as the effects of annealing temperature, cycling growth, preferred orientation and hydrostatic pressure; comments in the literature on superconductivity of uranium are also covered. 50 ref. (P15g; U)

338-P. Pile-Induced Threshold Reactions in Stainless Steel. R. P. Schuman and A. C. Mewherter. General Electric Co., *U. S. Atomic Energy Commission,* KAPL-1779, May 24, 1957, 14 p. (Available from U. S. Office of Technical Services, $.20.)

Pure samples of the major components of stainless steel have been irradiated in a receptacle slug in the BNL reactor. Radiochemical separations were made and the yields of long-lived activities produced by (n,p), (n,2n), and (n,α) reactions were determined. It was found that Co-58 from Ni-58 (n,p) Co-60 from Ni-60 (n,p), and Mn-54 from Fe-54 (n,p) were important activation products with yields comparable to Fe-59 from Fe-58 (n,γ). (P18h, SS)

339-P. (French.) **Temperature-Electric Resistance Curves for Thin Films of Bismuth.** Pierre Huet and Antoine Colombani. *Comptes Rendus,* v. 244, Feb. 11, 1957, p. 865-868.

Study of variation of resistance showed both reversible and irreversible modifications as well as semiconductor and metallic states. Three ranges of thickness studied; temperature coefficient curves in relation to thickness were traced. (P15g; Bi, 14-12)

340-P. (French.) **Anomalies of Hysteresis Cycles Due to Diffusion Lag.** Pierre Brissonneau. *Comptes Rendus,* v. 244, Feb. 11, 1957, p. 868-870.

Study of magnetic hysteresis of a specimen of carburized Armco steel exhibiting a very pronounced diffusion lag. 5 ref. (P16a; ST)

341-P. (French.) **Influence of Temperature on Height of Potential Barrier in Selenium Photo-Cells.** Georges Blet. *Comptes Rendus,* v. 244, Mar. 25, 1957, p. 1754-1756.

Electromotive force under vacuum of a selenium photo-cell studied at low temperature to determine variations in height of potential barrier as related to temperature variations. (P15, 2-11; Se)

342-P. (German.) **Iron-Silicon Alloys With Cubic Structure.** Fritz Assmus, Richard Boll, Dieter Ganz and Friedrich Pfeifer. *Zeitschrift für Metallkunde,* v. 48, June 1957, p. 341-343.

Induction and torque are reported which occur during magnetizing of 3% Si iron alloy with cubic structure in different directions. Preferential directions lay in the plane of rolling parallel and perpendicular to the rolling direction and have about equal magnetic properties. Characteristic parts of the induction curve can be calculated successfully from the spread in orientation. The results are compared with those on Goss material. The properties in rolling direction are about equal. However, having two preferential directions instead of one (as the Goss material has) opens new applications for the cubic material. (P16r, 3-22; Fe, *Si*)

343-P. (Japanese.) **Shrinkage of Cast Iron Held at High Temperature in a Dilatation Test.** Shiro Morita. *Casting Institute of Japan, Journal,* v. 29, Apr. 1957, p. 307-310.

Expansion study of gray cast iron by dilatometer, the test piece being heated to 950° C. Result showed that some gray cast iron shrinks rather than expands. (P10d, 1-4; CI)

344-P. Hall Coefficient of Technically Pure Metals from 80 to 800° K. Pt. 1. V. Frank. *Applied Scientific Research,* v. 6, no. 5B, 1957, p. 379-387.

Results for Cu, Ag, Au, Pd and Pt. 19 ref.
(P15, 2-13; Cu-a, Ag-a, Au-a, Pd-a, Pt-a)

345-P. Low-Temperature Resistivity of Transition Elements; Vanadium, Niobium, and Hafnium. G. K. White and S. B. Woods. *Canadian Journal of Physics,* v. 35, Aug. 1957, p. 892-900. (CMA)

Thermal and electrical conductivity data were obtained in the ranges 2-90° K. and 2-300° K., respectively, for the metals vanadium, columbium and hafnium. Ice-point values of the

"ideal" electrical resistivity are given and those for the "ideal" thermal resistivity are deduced. 23 ref. (P11, P15g, 1-13; V, Cb, Hf)

346-P. Equilibrium Conditions in the Copper - Oxygen - Cadmium - Phosphorus System. A. D. Michael, R. W. Ruddle and A. Cibula. *Institute of Metals, Journal,* v. 85, Aug. 1957, p. 506-517.

Results of a series of slag-metal fusions in which copper containing small amounts of phosphorus and cadmium was brought into equilibrium at 1200° C. with a copper-oxygen-cadmium-phosphorus slag. A further series of fusions were made with cadmium-free metal and slag. 7 ref. (P12; Cu, *O, Cd, P,* RM-q)

347-P. Resistance and Magneto-Resistance of Dilute Alloys of Copper and Gold With Nickel at Low Temperatures. G. J. Los and A. N. Gerritsen. *Physica,* v. 23, July 1957, p. 633-640.

In continuation of a systematic investigation on the electrical properties of alloys of noble metals and transition metals at low concentration, electric resistance measurements on dilute copper-nickel and gold-nickel alloys are reported. 7 ref. (P15g, 2-13; Cu, Au, Ni)

348-P. Antiferromagnetism of Manganese Copper Alloys. G. E. Bacon. *Royal Society, Proceedings,* v. 241, Aug. 7, 1957, p. 223-238.

Manganese-rich gamma phase alloys of manganese and copper have been investigated by neutron and X-ray diffraction techniques, and the temperature variations of magnetic susceptibility and electrical resistivity have been measured. The disappearance of long-range antiferromagnetic ordering has been correlated with the face-centered-tetragonal→face - centered - cubic martensitic transformation of these alloys. The Neel temperatures and the magnetic moments of the manganese ions, for alloys of various compositions, have been determined. 21 ref. (P16, P15g, N6q; Mn, *Cu*)

349-P. Calorimetric Investigation of Zirconium, Titanium and Zirconium Alloys From 60 to 960° C. J. L. Scott. Oak Ridge National Laboratory. *U. S. Atomic Energy Commission,* ORNL-2328, Aug. 12, 1957. 122 p. (CMA)

Full benefits of zirconium as a nuclear metal may be realized only by alloying for high-temperature strength. Changes in thermodynamic functions (i.e., specific heats and heats of transformation) with the kind and amount of additive were studied for zirconium and titanium to better understand alloying behavior. Zirconium alloys with 0.881-5.37% Ag, 7.77% In, 17.5% Nb, 34.4% Ti and 300 ppm. hydrogen were investigated. 40 ref. (P12; Zr, Ti)

350-P. (French.) **Attempt at Interpretation of the "Creeping" of Hysteresis Cycles.** Louis Neel. *Comptes Rendus,* v. 244, May 27, 1957, p. 2668-2674.

It is possible to interpret phenomena of "creeping" by assuming that the successive hysteresis cycles, described within the same limits and macroscopically identical, actually differ microscopically. (P16a)

351-P. (French.) **Transmission of Heat by Liquid Metals Flowing in Circular Pipes.** *Ministere de l'Air, Publications Scientifiques et Techniques,* no. N.T. 63, 1956, p. 15-25.

Laminar convection and turbulent convection: summary of theories, equations and experimental results of various researchers. (P11j; 14-10)

352-P. (French.) **Electrical Conductivity of Very High Purity Metals at Very Low Temperatures and Application to Phenomena of Recrystallization.** Michel Caron. *Ministere de l'Air, Publications Scientifiques et Techniques,* Paris, no. 328, 1957, 58 p.

Chemical analysis of aluminum and iron specimens studied; apparatus used; influence of recrystallization of pure aluminum on electrical conductivity; electrical resistance of pure aluminum at very low temperatures; conductivity of high-purity iron at low temperatures; conclusions. 33 ref. (P15g, 2-13; Fe-a, Al-a)

353-P. (German.) **Attack on Iron by Zinc Melts Containing Cadmium.** Dietrich Horstmann. *Archiv für das Eisenhüttenwesen,* v. 28, Apr. 1957, p. 195-199.

Cadmium increases the attack by molten zinc on iron. Determination of the iron loss and the growth of the iron-zinc alloy layer, time and temperature dependence of the attack and the relationship between the temperature dependence of the attack and the melt equilibrium of zinc-cadmium alloys. (P12, R6m; Fe, Zn, *Cd*)

354-P. (German.) **Studies on the Electrolytic Absorption of Carbon, Boron, Nitrogen Chromium, Silicon and Phosphorus in Steel and Armco Iron.** Friedrich Erdmann-Jesnitzer. *Neue Hütte,* v. 2, June 1957, p. 349-361.

Principles of electrolytic absorption in the solid state; preparation of test pieces; microhardness values; spectroscopic analysis differences caused by various types of crystals; preparation of nitrogenous test pieces; electrolytic absorption of nitrogen. 31 ref.
(P15p; ST, Fe, *C, B, N, Cr, Si, P*)

355-P. (Rumanian.) **Determination of the Rate of Reaction Between Molybdenum Sulphide and Molybdenum Trioxide II.** I. Galatenu. *Revista de Chimie,* v. 8, May 1957, p. 363-369. (CMA)

The rate of the reaction $MoS_2 + 6MoO_3 \rightleftharpoons 7MoO_2 + 2SO_2$ was studied with regard to its dependence on the initial proportion of the reagents and on the temperature. Optimum data for conducting the reaction under industrial conditions were derived. 14 ref. (P13d, C general; Mo)

356-P. (Russian.) **Investigation of the Thermodynamic Properties of Binary Metallic Systems by the Electromotive Force Method. Pt. 2. System Cadmium-Copper.** A. V. Nikol'skaya, P. P. Otopkov and Ya. I. Gerasimov. *Zhurnal Fizicheskoi Khimii,* v. 31, May 1957, p. 1007-1012.

E.m.f. of the concentration cells $Cd/CdCl_2/(Cd_xCu_{1-x})^+$ for copper-cadmium melts over the range 0.948—0.460 mole fractions of cadmium at 25° temperature intervals from 575 to 650° C. 8 ref.
(P12, M24; Cd, Cu)

357-P. (Russian.) **Solubility of Thorium in Liquid Zinc.** M. V. Smirnov, N. G. Hyushchenko, S. P. Detkov and L. E. Ivanovskii. *Zhurnal Fizicheskoi Khimii,* v. 31, May 1957, p. 1013-1018.

Thorium-zinc alloys containing up to 25% thorium by weight were investigated. These were shown to consist of two phases; practically pure zinc and the metallic compound Th_2Zn_{17}. The latter was isolated by dissolving the excess zinc of the alloys in aqueous solutions of ammonium salts or in alkalis. The solubility of thorium in liquid zinc was determined at 419 to 825° C. 3 ref. (P12e; Zn, Th, 14-10)

358-P. Density and Viscosity of Titanium Tetrabromide. J. M. Blocher, Jr., R. F. Rolsten and I. E. Campbell. *Electrochemical Society, Journal,* v. 104, Sept. 1957, p. 553-555. (CMA)

Density and viscosity measurements of liquid titanium tetrabromide were conducted and data are tabulated. These data may be represented respectively, by the equations d = 2.953 − 0.00225 g. per cc. (t in °C) and $\log \eta = 102{,}310T^{-2} - 177.12T^{-1} - 0.1947$ (T in °K). Vapor density measurements show that titanium tetrabromide vapor is monomeric and undissociated at the boiling point. 4 ref. (P10a, P10f; Ti, 14-18)

359-P. Heat Capacity of Holmium From 15 to 300° K. B. C. Gerstein, et al. *Journal of Chemical Physics,* v. 27, Aug. 1957, p. 394-399. (CMA)

Heat capacity maxima are at 19.4 and 131.6° K.; data are tabulated. The lower maximum shows a dependence on thermal history. Thermodynamic functions have been tabulated and entropy correlations were made. P12r; Ho)

360-P. Nickel Alloys With Special Properties. C. Gordon Smith. *Metal Industry,* v. 91, Aug. 23, 1957, p. 145-147.

Notes low expansion of certain nickel-iron alloys and the variation of Young's modulus and temperature coefficient for different nickel-iron compositions; applications making use of these properties.
(P11g, Q21a; Ni, 17-7)

361-P. Nickel Alloys With Special Properties. C. Gordon Smith. *Metal Industry,* v. 91, Aug. 30, 1957 p. 169-170.

Permeability and saturation values for nickel-iron alloys; magnetic properties and magnetostriction; applications. (P16; Ni)

362-P. Atomic Heats of Calcium, Strontium and Barium Between 1.5° and 20° K. L. M. Roberts. *Physical Society, Processing,* v. 70, 452 B, Aug. 1, 1957, p. 738-743.

Atomic heats of calcium, strontium and barium have been measured with the primary object of obtaining values for the electronic contributions to the specific heats. 7 ref. P12r, P15g; Ca, Sr, Ba)

363-P. Atomic Heats of Lithium, Sodium and Potassium Between 1.5° and 20° K. L. M. Roberts. *Physical Society, Processings,* v. 70, 452 B, Aug. 1, 1957, p. 744-752.

Atomic heats of lithium, sodium and potassium have been measured chiefly with the object of determining the effective mass of the conduction electrons. 16 ref. (P12r, P15g; Li, Na, K)

364-P. The Effect of Pressure on the Electrical Resistance of Copper at Low Temperatures. J. S. Dugdale and D. Gugan. *Royal Society, Proceedings,* v. 241, Aug. 20, 1957, p. 397-407.

Resistivity of commercially pure copper and an alloy of 0.056 at. % iron in copper under hydrostatic pressures up to 3000 atm. measured at temperatures between 4° K. and room temperature. Effect of pressure on ideal resistivity is in agreement with theoretical expectations and is governed chiefly by effect of pressure on the lattice vibrations. 24 ref. (P15g, 3-24, 2-13; Cu)

365-P. Secondary Electron Emission in Copper, Germanium and Tin in the Solid and Liquid States. V. G. Bol'shov and V. K. Seleznev. *Soviet Physics,* v. 1, No. 8, p. 1612-1618.

Measurements of coefficient of secondary electron emission; effects of temperature variations and fusion; measurements of energy distribution of secondary electrons for tin. 12 ref. (P-15k; Cu, Ge, Sn)

366-P. Tantalum Field Emission. M. I. Elinson and G. F. Vasil'es. *Soviet Physics,* v. 1, No. 8, p. 1623-1625. (Translated by American Institute of Physics).

Effects of temperature on boundary changes and rate of emission current. Behavior of tantalum compared with tungsten. 2 ref. (P15k; Ta)

367-P. (English.) **Some Factors Affecting the Decay of Secondary Electron Emission of Silver-Magnesium Alloys.** Masaki Hirashima and Shoichi Miyashiro. *Physical Society of Japan, Journal,* v. 12, July 1957, p. 770-777.

The secondary emission yield is observed to decay very rapidly under electron bombardment especially during the exhaust process using oil diffusion pump. Factors affecting the decay, a method of remedy to make the decayed yield recover, and effects of various gases and vapors on the yield. 13 ref. (P15k; Ag, Mg)

368-P. (Czech.) **Activation Energy of the Viscosity of Molten Metals.** Antonin Hrbek. *Hutnické Listy,* v. 12, no. 7, 1957, p. 593-597.

Activation energy of viscosity and "reduced activation energy of viscosity"; values of reduced activation energy in relation to temperature for sodium, aluminum, potassium, iron, copper, zinc, silver, cadmium, tin, antimony, gold, mercury, lead and bismuth. Derived equation expressing relation of viscosity and temperature. 32 ref. (P10f, P13a; 14-10)

369-P. (German.) **Measurement of the Coefficient of Diffusion and the Solubility of Hydrogen in Aluminum and Copper.** Walter Richenauer and Alfred Pebler. *Zeitschrift für Metallkunde,* v. 48, July 1957, p. 373-378.

From the measurement of degassing characteristics with a newly developed apparatus the coefficients of diffusion of hydrogen in differently shaped aluminum and copper bodies and its solubility in the two metals were determined. Sievert's square-root-law for the solubility of hydrogen in copper was confirmed from measurements at various temperatures. From the observations it may be deduced that diffusion is the primary factor is solubility. 15 ref. (P12e, N1a; Al, Cu, *H)*

370-P. (French.) **The Electronic Component of the Specific Heat of Transition Metals.** R. Blanpain. *Societe Royale des Sciences de Liege, Bulletin,* v. 27, Apr. 1957, p. 165-181.

Sommerfeld coefficient values for transition elements are studied in connection with number of valence electrons and an empirical *d* band structure is established. This is compared with theoretical curves of density of *d* states. Further experimental study is suggested, particularly for the manganese group, for which theoretical predictions do not seem to be confirmed by experience. 57 ref. (P12r; Mn)

371-P. (French.) **The Specific Electronic Heat of Rhenium.** R. Blanpain. *Societe Royale des Sciences de Liege, Bulletin,* v. 27, Apr. 1957, p. 182-188.

Value of Sommerfeld coefficient for rhenium is deduced from calorimetric data in field of intermediate temperatures (20 to 300° K.) and compared with values obtained from magnetic study of this supraconductor. 18 ref. (P12r; Re)

372-P. Effect of Manganese on the Curie Point of Cementite. Earl C. Roberts. *American Society for Metals, Transactions,* v. 50, Preprint No. 11, 1957, 21 p.

By determining the curves showing the gradual loss of cementite

ferromagnetism with temperature for three series of annealed steels, a generalized graph relating the Curie temperature of the cementite to the manganese content of the cementite has been drawn. 20 ref.
(P16d, 2-10; ST, Mn)

373-P. Growth of Uranium Upon Thermal Cycling. J. E. Burke and A. M. Turkalo. *American Society for Metals, Transactions,* v. 50, Preprint No. 17, 1957, 17 p.

The driving force is the stress that develops between differently oriented anisotropic uranium grains when the temperature is changed. At high temperatures this stress is relaxed by viscous flow at the grain boundary, and at low temperatures by crystallographic slip in some of the grains. The two mechanisms of relaxation are shown to combine to produce a "thermal ratchet" which causes continued elongation of textured polycrystalline uranium on thermal cycling. 6 ref.
(P10d, P11; U)

374-P. Effects of Cycling Variables Upon Growth Rate of 300° C. Rolled Uranium. R. M. Mayfield. *American Society for Metals, Transactions,* v. 50, Preprint No. 37, 1957, 18 p.

Thermal cycling growth rate of 300° C. rolled uranium rods has been shown to be profoundly affected by cycling variables such as heating and cooling rate, temperature limits, temperature range and holding times at temperature. For any appreciable growth to occur, the upper cycling temperature must be above 350° C. For a constant cycling temperature range, maximum growth rates per cycle are observed with slow heating and fast cooling. Minimum rates are obtained with fast heating and slow cooling, and equal rates yield intermediate values. 10 ref. (P10d, P11; U)

375-P. Effects of Fabrication and Heat Treatment Variables Upon the Thermal Cycling Behavior of Uranium. S. T. Zegler, R. M. Mayfield and M. H. Mueller. *American Society for Metals, Transactions,* v. 50, Preprint no. 56, 1957, 37 p.

Cycling variables, specifically heating and cooling rates, are shown to have a pronounced effect on the growth of beta-treated uranium. The temperature of beta-phase heat treatment influences growth only slightly. The time at temperature, cooling rate and the fabrication history of the material prior to heat treating are shown to have no effect on the growth of beta treated material. The cooling rate on beta heat treatment is shown to be the major factor influencing surface wrinking. 5 ref.
(P10d, P11, 3-18, 2-14; U)

376-P. Properties of Palladium-Rhodium Alloys. F. E. Hoare and J. Preston. *Nature,* v. 180, Aug. 17, 1957, p. 334.

Investigation covering magnetic properties of a range of alloys and pure metals and low-temperature specific heats of four palladium-rhodium alloys and interpretation of results by band theory.
(P16, P12r; Pa, Ph)

377-P. Effect of Some Metal Additions on Molybdenum Disilicide. R. D. Grinthal. *Powder Metallurgy Bulletin,* v. 8, June 1957, p. 18-22. (CMA)

Electrical resistivity, modulus of traverse, hardness, impact strength and oxidation resistance effects on molybdenum disilicide from adding copper, titanium and chromium were studied.
(P general, Q general, 2-10; Mo, 6-20)

378-P. New Method of Studying Equilibria in Metal-Slag Systems. V. F. Surov, O. V. Travin and L. A. Shvartsman. Problems of Metallography and Metal Physics, 4th Collection of Papers, 1955, Moscow, p. 616-250. (*Henry Brutcher Translation* no. 3933.)

New method for determining the desulphurizing and dephosphorizing power of slags over a wide range of compositions set-up and procedure, based on use of sulphur^{35} and phosphorus^{32}, respectively.
(P12d, 1-4; RM-q)

379-P. Solubility of Oxygen in Manganese-Containing Liquid Iron. B. V. Linchevskii and A. M. Samarin. *Izvestiya Akademii Nauk SSSR, Otdelenie Tekhnicheskikh Nauk,* no. 2, Feb. 1957, p. 9-18. (*Henry Brutcher Translation* no. 4030.)

Determination of the deoxidizing power of manganese within a wide range of concentrations; nature of oxidation products; influence of manganese on activity of oxygen dissolved in iron-managanese melts. Solubility of oxygen in liquid iron; oxidation of manganese dissolved in liquid iron studied by fixing the equilibrium state in system "liquid metal-solid or liquid oxide phase—steam-hydrogen mixture" at controlled metal temperatures and gas-

phase compositions. Deoxidation of iron with manganese; calculations of dissociation pressure of solid manganous oxide at 1600° C.; activity of oxygen in iron-manganese melts as function of manganese content. (P12e; Fe, *Mn*, AD-r)

380-P. Effect of Carbon Upon the Solubility of Hydrogen in Liquid Iron-Carbon Alloys. K. T. Kurochkin, P. E. Nizhel'skii and P. V. Umrikhin. *Izvestiya Akademii Nauk SSSR, Otdelenie Tekhnicheskikh Nauk,* no. 2, Feb. 1957, p. 19-26. (*Henry Brutcher Translation* no. 4031.)

Effect of carbon upon solubility and rate of solution of hydrogen in liquid Fe-C alloys with 0.02% to over 4.3% carbon, as well as upon residual hydrogen content of solid alloys subsequent to their saturation with hydrogen in the liquid state. Particulars on apparatus used in study; formula for calculation of 'hot volume'. (P12e; Fe, *C, H*)

381-P. (French.) **Study of the Ferromagnetic Resonance of Iron Monocrystals at 9500 Megahertz.** A. Strub. *Archives des Sciences,* v. 10, Special Section on 6th Colloque Ampére held at Rennes-St-Malo, Apr. 1957, p. 142-146.

Principal features of an apparatus for measuring X-band hyperfrequencies; apparatus designed for study of various properties of oriented ferromagnetic specimens following orientation of their crystalline axes in relation to directions of static magnetic fields and applied UHF. Preliminary results of measurements on ferrosilicon monocrystals. 5 ref.
(P16f, 1-3; Fe, *Si*, SGA-n)

382-P. (French.) **Action at Low Temperature of High-Speed Neutrons on Metals Having a Cubic-Centered Structure.** Pierre Lucasson. *Comptes Rendus,* v. 245, Aug. 12, 1957, p. 796-799.

Samples of columbium, tantalum and tungsten were irradiated at low temperature and variations of electrical resistance were measured in terms of integrated flux. Isochronic "annealing" was then performed on samples and corresponding variations in resistance were measured. 4 ref. (P15g, 2-17; Cb, Ta, W)

383-P. (French.) **Impurities in Metals and Their Influence of Surface Conditions and Specific Properties.** André Roos. *Peintures-Pigments-Vernis,* v. 33, Aug. 1957, p. 702-710.

Nature and origin of impurities in metal surfaces; effects of impurities on surface properties, with particular attention to diffusion, adsorption and ionic properties; atomic and ionic aspects of metal surfaces; study of ionic emission and surface oxidation by photoelectric reflectometry; study of surface reactions in light of recent theories of physical chemistry. (P13, N1)

384-P. (Slovene.) **Thermodynamics in Metallurgy.** Anton Podgornik. *Rudarsko-Metalurski Zbornik,* no. 2, Summer 1957, p. 95-109.

Survey of contemporary metallurgical thermodynamics. Various measuring techniques, such as measurement of vapor pressures, equilibrium and electromotive forces. Importance of W. Oelsen's thermodynamic analysis is stressed. 14 ref. (P12)

385-P. Electrical Characteristics of a Nickel - Chrome - Aluminum - Copper Resistance Wire. C. Dean Starr and T. P. Wang. *Institution of Electrical Engineers, Proceedings. Radio and Electronic Engineering, (Including Communication Engineering),* v. 104, Pt. B, no. 17, Sept. 1957, p. 515-518.

Changes in resistance and temperature coefficient of resistance during heat treatment of alloy known as Evanohm. From nature of resistance-temperature curve and X-ray diffraction data it is proposed that electrical changes be attributed to short-range order. Data show that both mean temperature coefficient of resistance and minor deviations in linearity in resistance-temperature curve vary in systematic manner during heat treatment and that changes are independent of prior thermal history. Resistance changes after heat treatment, caused by either surface tarnishing, oxidation or application of strain during fabrication, are discussed. 3 ref.
(P15g, 2-14; Ni, Al, Cr, Cu, SGA-r)

386-P. Theory of Ferromagnetism of Metals and Alloys at Low Temperatures. E. S. Kondorski and A. S. Pakhomov. *Soviet Physics—JEPT,* v. 5, no. 2, p. 269-276. (Translated by American Institute of Physics.)

Formulas are obtained for temperature dependence of spontaneous magnetism near absolute zero for ferromagnetic lattice consisting of

one kind of atoms in case in which number of electrons with uncompensated spins is greater than number of atoms, and for lattice of binary ordered alloys of various structures. In the calculation, use is made of method of approximate second quantization. It is shown that, in all cases considered, the theory leads to temperature dependence of spontaneous magnetization of the form of a 3/2 power law. 8 ref. (P16, 2-13)

387-P. Vapor Pressure of Thulium Metal. F. H. Spedding, R. J. Parton and A. H. Daane. *American Chemical Society, Journal,* v. 79, Oct. 5, 1957, p. 5160-5163. (CMA)

Vapor pressure was measured in the range 809-1219° K., using modifications of the Knudsen effusion method. Results obtained can be expressed by the relation log P(mm.) = (−1.2552 ± 0.0045) × 10^4/T + 9.1761 ± 0.0457. A heat of sublimation of − 57.44 ± 0.20 k-cal. is indicated for the temperature range investigated. 11 ref. (P12c; Tm)

388-P. Doubly-Oriented Magnetic Sheet Will Increase Efficiency of Electrical Equipment. *Iron and Steel Engineer,* v. 34, Oct. 1957, p. 154-157.

"Four square" silicon iron developed at General Electric Research Laboratory. (P16; SGA-n, Fe, *Si*)

389-P. Performance of Composite Peltier Junctions of Bi_2Te_3. Theodore S. Shillidan. *Journal of Applied Physics,* v. 28, Sept. 1957, p. 1035-1043.

Experimental Peltier refrigerator utilizing thermo-elements of annular configuration was constructed. Thermo-electric materials used were p and n-type Bi_2Te_3. A simple theory relating to performance of Peltier thermocouples was derived. Experimental performance of device is shown to agree with theoretical predictions within experimental errors. 15 ref. (P15p, X9q, 17-7; Bi, Te)

390-P. Atomic Heats of Titanium, Zirconium and Hafnium. N. M. Wolcott. *Philosophical Magazine,* v. 2, Oct. 1957, p. 1246-1254. (CMA)

The specific heats (electronic and lattice contributions) were measured in the 1.2-20.0° K. range. The temperature variation of the Debye temperature is similar for the three metals if a suitably reduced temperature scale is used. (P12r; Ti, Zr, Hf)

391-P. Zirconium-Water Reactions. B. Lustman. Westinghouse Atomic Power Division. *U. S. Atomic Energy Commission,* WAPD-137, Dec. 1, 1955, 39 p. (CMA)

The heating curve of Zircaloy in a reactor core and the cooling curve of molten droplets in water were determined. With zero heat loss a self-sustaining reaction between Zircaloy-2 and steam is possible. A low cooling rate suffices to prevent heating up. The core and droplet reactions are sensitive to the rate of heat dissipation, access of reactants and hydrogen blanketing. 12 ref. (P12; Zr, NM-a38)

392-P. (English.) **Magnetic Anisotropy in Connection With Rolling in the Course of Producing Single Crystals of Silicon Steel.** Tadaoshi Yamashita and Eiji Tatsumoto. *Physical Society of Japan, Journal,* v. 12, Aug. 1957, p. 975.

Cause of such anisotropy investigated by optical and electron microscopy and found to be due to small pinholes or pits lining up in groups parallel to direction of rolling. (P16, N3r; ST, *Si*)

393-P. (German.) **Critical Magnetic Fields of Superconducting Vanadium.** G. Busch and J. Mueller. *Helvetica Physica Acta,* v. 30, no. 4, 1957, p. 230-233. (CMA)

Measurements of the magnetic permeability of extremely pure vanadium samples showed transition points in a zero field between 5.28 and 5.30° K. At absolute zero a remarkably low value of 1020 oersteds was found for the critical field. From these measurements the electronic specific heat was calculated as (6.4 ± 0.2)10^{-3} joule/mol/°K^2, rather different from the values obtained by calorimetric determinations. 6 ref. (P16q; V)

394-P. (Japanese.) **Investigation of Nitrides in Cast Iron. Pt. 1.** Yoshisada Ueda and C. Hisatsune. *Casting Institute of Japan, Journal,* v. 29, Aug. 1957, p. 618-621. (CMA)

Thermodynamic studies on the various nitrides in the systems Fe-C-Ti-N, Fe-C-Zr-N, Fe-C-Mo-N and Fe-C-V-N. TiN, ZrN and VN were found to be stable at room temperature, while Mo_2N was stable only at about 600° C. or higher. Below this temperature Mo_2C became more

stable and only the carbide was found at room temperature. (P12, M24d; CI, *N*)

395-P. (Russian.) **Effect of Radiation on the Electrochemical Activity of Zirconium.** I. L. Rozenfel'd and E. K. Oshe. *Akademiya Nauk. S.S.S.R., Doklady,* v. 114, May 1, 1957, p. 143-145. (CMA)

Sudden and intense rises of electric current in the electrolyte (3% NaCl) were observed when the zirconium cathode was irradiated with high-energy electrons. The current, which reached values 15-20 times as high as the current before the irradiation, dropped to the initial value as soon as the irradiation ceased. The effect is attributed to changes in the electrochemical activity of zirconium due to formation of semiconducting films which are known to respond to outside stimuli by important changes of physical properties, such as electrical conductivity. (P15, 2-17; Zr)

396-P. (Russian.) **Thermal Behavior of Spontaneous Magnetization of Nickel Alloys in Neighborhood of Curie Point.** K. Belov and Ya. Paches. *Fizika Metallov i Metallovedenie,* v. 4, no. 1, 1957, p. 48-53.

Curves of spontaneous magnetization in respect to temperature are determined by three different methods for nickel and nickel alloys; a most reliable way of determination of Curie temperature is proposed. 4 ref. (P16d; Ni)

397-P. (Russian.) **Magnetic Properties of the Self-Ordering Alloy-Fe_3Al.** V. I. Ivanovskii. *Fizika Metallov i Metallovedenie,* v. 4, no. 1, 1957, p. 70-75.

Magnetic properties of Fe_3Al alloy in respect to temperature. Kinetics of force of coersion and magnetic density in the process of self-ordering of the alloy. Receptivity of the alloy at order-disorder transition temperature. 5 ref. (P16, N10; Fe, Al)

398-P. (Russian.) **Investigation of Tendency of Cast Iron to Swell.** N. N. Popova and N. A. Kravchenko. *Zavodskaia Laboratoria,* v. 23, July 1957, p. 817-818.

Apparatus whereby any irreversible volume changes of cast iron on prolonged heating can be measured. (P10d, 1-3; CI)

399-P. (English.) **Electrical Properties of P-Type Indium Antimonide.** Tadao Fukuroi and Chikako Yamanouchi. *Tohoku University, Science Reports of the Research Institutes,* Series A, v. 9, Aug. 1957, p. 262-265.

Electrical properties of P-type InSb from ambient to liquid helium temperatures are measured and several parameters associated with the charge carries are obtained. 3 ref. (P15, 2-13; In, Sb)

400-P. (English.) **Relationship Between the Hall Coefficient and the Resistivity of Semiconductors, Taking Various Scattering Mechanisms of the Charge Carriers Into Account.** Tadao Fukuroi and Chikako Yamanouchi. *Tohoku University, Science Reports of the Research Institutes,* Series A, v. 9, Aug. 1957, p. 267-272.

Jones has given an expression for the Hall coefficient of semiconductors taking into account both the thermal and the ionized impurity scattering of electrons (or holes) in a band. As temperatures decrease, the influence caused by neutral impurity scattering and dislocation scattering becomes appreciable. Taking into consideration every two scattering mechanisms out of four mechanisms mentioned above, the relations between the Hall coefficient and the resistivity are calculated in a way analogous to that of Jones. 5 ref. (P15g)

401-P. (English.) **The de Haas-van Alphen Effect of Zinc.** Tadao Fukuroi and Yoshitami Saito. *Tohoku University, Science Reports of the Research Institutes,* Series A, v. 9, Aug. 1957, p. 273-292.

In a magnetic field of less than 16 kilo-oersteds and at a temperature of 4.2° K. and above, a remarkable periodic variation of magnetic susceptibility was found, and it is referred to as the long-period effect. (P16; Zn)

402-P. (English.) **Magnetization, Magnetostriction and Relaxation Phenomena During Isothermal Magnetic Annealing at High Temperatures in Ni-Co Alloys.** Hakaru Masumoto, Hideo Saito and Minoru Takahashi. *Tohoku University, Science Reports of the Research Institutes,* Series A, v. 9, Aug. 1957, p. 293-308.

An apparatus for the precise measurement of magnetostriction and magnetization at high temperatures was constructed, and these magnetic properties in nickel-cobalt alloys thermally demagnetized were measured at high temperatures. These properties showed a remarkable re-

laxation phenomenon. Their time changes at constant temperature were continuously traced under the external fields of various strengths from the instant of the application of the field onward.
(P16, 1-3; Ni, Co)

403-P. (German.) **Demonstration of Galvanomagnetic Effects in Metals and Semiconductors.** E. Saur. *Praxis der Physik/Chemie Photographie,* v. 6, July 15, 1957, p. 173-177.

Importance of Hall effect in explanation of conducting current mechanism. It lies in proof of "defective electrons", conductivity in conductors with positive Hall effect, and in possibility of determining quantitatively movements of electrons from Hall constant. 9 ref.
(P15p)

404-P. (German.) **Electrical Resistance of Metallic Melts. Pt. 2. Copper-Tin, Silver-Tin and Magnesium-Lead Alloys.** Albert Roll and Hasso Motz. *Zeitschrift für Metallkunde,* v. 48, Aug. 1957, p. 435-444.

Melts of certain intermetallic solid compounds have an unexpected high electrical resistance and small temperature coefficient. In the systems silver-tin and copper-tin, other resistance anomalies have been found which are not connected with occurrence of intermetallic phases in solid metallic compounds. 27 ref.
(P15g; Sn, Cu, Ag, Mg, Pb, 14-10)

405-P. (German.) **Electron-Optical Study of Processes in Strained Nickel Wires.** Christoph Schwink. *Zeitschrift für Metallkunde,* v. 48, Aug. 1957, p. 466-470.

Electron-optical method for measuring of pole points in magnetized wires; shift of pole points during straining and etching of nickel wires; definition of polycrystalline yield strength; thermal recovery and drawn-wire experiments. 15 ref.
(P16, Q21; Ni, 4-11)

SECTION Q

MECHANICAL PROPERTIES and TEST METHODS; DEFORMATION

1-Q. Frictional Characteristics and Surface Damage of Thirty-Nine Different Elemental Metals in Sliding Contact With Iron. C. L. Goodzeit, R. P. Hunnicutt and A. E. Roach. *ASME, Transactions,* v. 78, Nov. 1956, p. 1669-1676.

Surface-damage characteristics are related to the relative hardness of the metals in sliding contact, their mutual solubility and their ability to form intermetallic compounds. (Q23f; Fe)

2-Q. Metallurgists Groom Molybdenum for High-Temperature Use. Irwin Stambler. *Aviation Age,* v. 26, Nov. 1956, p. 34-41.

Alloy content-rupture strength relationship was nonlinear; tensile strength increased with strain hardening; panel prepared under argon showed good resistance. (Q general, 2-12; Mo)

3-Q. Ductility of Tungsten-Arc Welds in Molybdenum. Norman E. Weare, Robert E. Monroe and David C. Martin. *Battelle Memorial Institute (U. S. Atomic Energy Commission),* BMI-1139, Oct. 1956, 30 p.

Effects of cleaning methods, sheet structure, atmosphere purity and tungsten contamination. A significant difference in bend ductility was found among welds made in different heats. (Q23p; Mo, 7-1)

4-Q. The Plastic Deformation of Aluminium and Aluminium Alloys. G. Thomas and J. Nutting. *Institute of Metals, Journal,* v. 85, Sept. 1956, p. 1-7.

Electron microscope was used to study metallography of slip in pure aluminum and aluminum alloyed with up to 7% magnesium, 5% silver and 4% copper. (Q24a, X3; Al)

5-Q. Some Observations on the Development of Face-Centered Cubic Rolling Textures. F. R. Braybrook and E. A. Calnan. *Institute of Metals, Journal,* v. 85, Sept. 1956, p. 11-14.

Measurements of copper and α-brass indicate that, while the latter is consistent with deformation by slip on planes, an additional mechanism is operative in copper. (Q24a, Cu)

6-Q. The Effect of High and Low Temperatures on the Notched-Bar Characteristics of a Cast, High-Tensile, Beta-Brass. A. R. Bailey, R. McDonald and L. E. Samuels. *Institute of Metals, Journal,* v. 85, Sept. 1956, p. 25-29.

The Charpy figure was 28.5 ft.lb., decreasing to 11 ft.lb. at $-195°$ C.; fractures were transcrystalline in this range, although there was a small but significant tendency to intercrystalline cracking at room temperature, which gradually disappeared as the temperature of testing was lowered. (Q23r, 2-11; Cu)

7-Q. Propagation of Cleavage Cracks in Crystals. John J. Gilman. *Journal of Applied Physics,* v. 27, Nov. 1956, p. 1262-1269.

Data on crack propagation in elastic media. For inelastic media, it is postulated that two critical velocity conditions must be satisfied or crack propagation cannot occur. (Q26n)

8-Q. Flexibility of Zinc Coatings. H. Bablik, E. Goetzl and E. Nell. *Metal Industry,* v. 89, Nov. 2, 1956, p. 373-375.

Zinc of 99.99% purity in cast state will withstand a maximum elongation of 0.5% without rupture, electrolytic zinc about 1.0%. Sendzimir-type sheets show microscopic injury after double bends. (Q23; Zn, 8-15)

9-Q. Preliminary Study of the Fatigue of Metals in Liquid Metal En-

vironments. J. W. Martin and G. C. Smith. *Metallurgia*, v. 54, no. 325, Nov. 1956, p. 227-232, 238.

Results of fatigue tests at room temperature on amalgamated copper alloy, and at 300° C. on mild steel and stainless steel in contact with liquid tin and liquid sodium, respectively.
(Q7; Na, Cu, CN, SS, Sn, 14-10)

10-Q. Rare Earths in Steel Castings. W. J. Jackson. *Metallurgia*, v. 54, no. 325, Nov. 1956, p. 233-238.

Rare earth additions improve ductility and impact properties, reduce susceptibility to hot tearing and increase fluidity. Both hardenability and weldability appear to be unaffected. (Q23, Q26q; EG-g, ST)

11-Q. Effect of Baking on Delayed Fracture of Electroplated Ultra High-Strength Steel. *Naval Research Laboratory*, NRL Report 4839, Oct. 1956, 18 p.

Stress-relief for chromium-plated steel was complete after baking 24 hr.; for cadmium-plated steel it was incomplete after baking 200 hr.; and for zinc-plated steel little relief was seen after 200 hr.
(Q26, J1a; ST, 8-12)

12-Q. Mechanical Properties of Aluminum Multiwave Cores. E. W. Kuenzi and V. C. Setterholm. *U. S. Department of Agriculture, Forest Products Laboratory, Report No.* 1855, Sept. 1956, 30 p.

Detailed descriptions of core materials and testing procedures, analyses of experimental data, including methods for predicting compressive strengths from basic material properties. (Q general; Al)

13-Q. Effect of Temperature on the Fracturing Behavior of Mild Steel. J. D. Lubahn. *Welding Journal*, v. 35, Nov. 1956, p. 557s-568s.

Strength, energy-absorbing capacity, ductility and amount of gradual tearing preceding brittle crack propagation by cleavage are among the fracture properties observed at various temperatures. (Q26s, 2-11; CN)

14-Q. Behavior of Hard Chromium Deposits Under Cyclic Stress. I-II. A. A. Starosel'skii and D. N. Garkunov. *Henry Brutcher Translation Nos.* 3105 and 2954, 5 p. and 3 p. (From *Vestnik Mashinostroeniya*, v. 31, no. 3, 1951, p. 33-37; and v. 32, no. 6, 1952, p. 55-56.) Henry Brutcher, Altadena, Calif.

Mechanical strength, nature of failure and strength of bond between chromium deposit and basis metal. Description of failure of light and heavy deposits. (Q23n; Cr, 8-12, AY)

15-Q. Study of Fatigue Strength of Shot Peened Specimens Under Stresses Exceeding the Fatigue Limit. M. Ya. Shashin. *Henry Brutcher Translation No.* 3145, 5 p. (From *Vestnik Mashinostroeniya*, v. 32, no. 9, 1952, p. 57-60.) Henry Brutcher, Altadena, Calif.

S-N curves representing nonstrain hardened specimens and specimens strain hardened at different speeds of the shot stream and for different times. Optimum depth of strain hardening. (Q23g, G23n; ST)

16-Q. Creep of Nodular Cast Iron. V. S. Ivanova and I. A. Oding. *Henry Brutcher Translation No.* 3767, 5 p. (From *Izvestiya Akademii Nauk SSSR, OTN*, no. 7, 1955, p. 89-92.) Henry Brutcher, Altadena Calif.

Previously abstracted from original. See item 1037-Q, 1955.
(Q3, M27; CI)

17-Q. (Czech.) **Strength Limits of Material.** Jaroslav Nemec. *Hutnické Listy*, v. 11, no. 10, Oct. 1956, p. 583-592.

Shows the development of plastic and brittle fractures by means of the energy balance and conditions which are responsible for their origin.
(Q26s)

18-Q. (Dutch.) **Internal Stresses in Metals and Their Measurement.** E. C. Smits. *Bedrijf en Techniek*, v. 11, no. 263, Oct. 6, 1956, p. 621-622.

Surveys mechanical, physical and chemical methods used in measuring stresses in metals. (Q25)

19-Q. (Dutch.) **Symposium on Testing Machines. II. Fatigue Testing Machines.** G. M. Canta. *Metaalinstituut T. N. O.* 1956, no. 45, Oct. 1956, 7 p.

Characteristics of three types of machines. (Q7)

20-Q. (Dutch.) **Brittle Fracture and Its Phenomena.** G. Salomon. *Metalen*, v. 11, no. 19, Oct. 15, 1956, p. 422-424.

Theoretical considerations on the initial stage of a fracture, from the elastic deformation to the brittle state. (Q26s)

21-Q. (Dutch.) **The Kinematic Representation of the Fracture Phenomenon.** J. Leeuwerik. *Metalen*, v. 11, no. 19, Oct. 15, 1956, p. 424-429.

The fracture phenomenon in various materials studied through stages called first and second breaking fronts. Fracture mechanism was followed through diagrams and microphotographs. (Q26)

22-Q. (French.) **Mechanical Heat Resistance of Light Alloys.** *Fonderie*, no. 128, Sept. 1956, p. 367-369.

Bibliographical data on light alloys of various life durations at high temperatures.
(Q general, 2-12; EG-a)

23-Q. (French.) **Evaluation of Strength of Steels.** M. Ros and A. Eichinger. *Revue de Métallurgie,* v. 53, no. 10, Oct. 1956, p. 757-766.
Interactions between numerous tests evaluated. (Q general; ST)

24-Q. (French.) **Hot Resistance of Titanium Alloys to Repeated Tensile Stress.** Georges Vidal. *Revue de Métallurgie,* v. 53, no. 10, Oct. 1956, p. 767-774.
Resistance to hot fatigue with repeated tensile stress is studied between 68 and 932° F. for chromium-iron, chromium-aluminum, and iron-aluminum-titanium alloys. (Q23q; Ti)

25-Q. (German.) **Method of Long-Time Creep Test in Furnace With Small Size Rods.** W. Stauffer and A. Keller. *Schweizer Archiv für Angewandte Wissenschaft und Technik,* v. 22, no. 10, Oct. 1956, p. 319-333.
Method of carrying out long-time stress-rupture tests which are more reliable than short-time fatigue tests. (Q3q)

26-Q. (German.) **Investigation of the Surface Structure Effect on Vibrational Fatigue Limit of Metal Parts.** E. Siebel and M. Gaier. *VDI Zeitschrift,* v. 98, no. 30, Oct. 1956, p. 1715-1723.
Effect of roughness depth and stress distribution for various materials. Suggestion for consideration of the roughness degree in strength calculation. (Q23g)

27-Q. (Japanese.) **Static Strength of Welded Joint (Report 1).** Shozaburo Ohta. *Journal of Railway Engineering Research (Japan),* v. 13, no. 16, Aug. 25, 1956, p. 425-448.
As a basic guide to rational design of welding, welded joints were investigated for stress distribution, breaking strength, breaking mechanism under static load.
(Q23, Q25k, K general, 18-17)

28-Q. (Russian.) **Pure Bending in Bars During Creep of the Material.** N. N. Shchetinin. *Izvestiia Akademii Nauk SSSR, Otdelenie Tekhnicheskikh Nauk,* 1956, no. 8, Aug. 1956, p. 37-41.
Bar is stressed by a constantly acting moment; solution of the problem of steady creep is obtained with a linearized equation of the theory of strain hardening (Q3, Cu)

29-Q. (Russian.) **Change in Structure and Mechanical Properties of Low-Alloy Steel in the Zone Around the Seam in Thermal-Cycle Welding Conditions.** L. S. Gushchina, G. N. Klebanov and M. Kh. Shorshorov. *Izvestiia Akademii Nauk SSSR, Otdelenie Tekhnicheskikh Nauk,* 1956, no. 8, Aug. 1956, p. 131-134.
Effect of the parameters of the thermal welding cycle on grain growth and on the hardness of austenite-decay products.
(Q general, N3; AY)

30-Q. (Russian.) **Method of Recording True Compressive-Strength Curves of a Metal.** G. E. Arkulis. *Zavodskaia Laboratoriia,* v. 22, no. 10, Oct. 1956, p. 1217-1220.
Describes compression-testing equipment and compares calculated and indicated values. (Q28; Pb)

31-Q. (Russian.) **Methods of Determining Tensile Strength of Ductile Metals.** Iu. I. Likhachev. *Zavodskaia Laboratoriia,* v. 22, no. 10, Oct. 1956, p. 1209-1217.
Comparison of experimental and calculated results. Tensile strength of circumferentially notched cylindrical specimens with prior low-temperature local plastic deformation. (Q27; ST)

32-Q. (Russian.) **Machine for Fatigue Testing of Coiled Cylindrical Springs and Wire.** D. A. Sveshnikov and G. P. Maslennikov. *Zavodskaia Laboratoriia,* v. 22, no. 10, Oct. 1956, p. 1245-1247.
Design and operation of the apparatus; interpretation of results. (Q7; ST, SG-b, 4-11)

33-Q. Investigation of Some Niobium-Base Alloys. Stan J. Paprocki and John T. Stacy. *Battelle Memorial Institute (U. S. Atomic Energy Commission),* BMI-1143, Oct. 1956, 16 p.
Twenty-seven alloys, containing 5 wt. % aluminum, chromium, iron, molybdenum, nickel, tantalum, tungsten, vanadium or zirconium, and with an addition of 0, 9.5, or 19.0 wt. % titanium, were examined for workability, ductility, and hardness at room temperature and 1600° F., and oxidation resistance at 1800° F. (Q23, 18-1, R2q; Cb)

34-Q. Selecting Copper and Its Alloys. IV. Mechanical Properties. *Copper & Brass Bulletin,* no. 179, Nov. 1956, p. 8-9.
Strength data for "cartridge brass, 70%" and "electrolytic tough pitch copper, hard temper". (To be continued.) (Q23n; Cu)

35-Q. Metallic Transfer in Engineering Operations. Radioactive Methods Used at Cambridge. F. P. Bowden and J. B. P. Williamson. *Engineering,* v. 182, Nov. 16, 1956, p. 619-621.
Whenever a metal is manipulated mechanically, small fragments of the tools used become torn out and em-

bedded permanently in its surface. This form of contamination can have a profound effect on the subsequent behavior of the metal. (Q9p)

36-Q. A Slip Line Field for the Hot Rolling Process. J. M. Alexander. *Institution of Mechanical Engineers, Proceedings,* v. 169, no. 50, 1955, p. 1021-1030.

A geometrical representation of the equations defining the flow in plane strain of a plastic rigid material facilitates adjustment, by inspection, of the slip line field until both velocity and stress boundary conditions are satisfied. (Q24)

37-Q. An X-Ray Examination of Preferred Orientation and the Transformation γ-α in a Stainless-Steel Wire. K. W. Andrews. *Iron and Steel Institute, Journal,* v. 184, Nov. 1956, p. 274-286.

The austenite undergoes transformation to ferrite on cold drawing. The maximum amount of ferrite depends on the composition, but also increases towards the center of the wire. (N8j, M26c; SS, 4-11)

38-Q. The Deformation of Molybdenum Single Crystals in Compression. J. H. Hoke and R. Maddin. *Journal of the Mechanics and Physics of Solids,* v. 5, Nov. 1956, p. 26-40 + 4 plates.

Tests on 43 crystals indicate that the slip process occurs in $<111>$ directions along zones of weakness which generally do not define a low indices plane. The position of this zone is influenced by external variables such as extraneous grains, prior deformation, and anvil or grip effect. (Q24a, Q28; Mo)

39-Q. Statistical Investigation of the Fatigue Life of Deep-Groove Ball Bearings. J. Lieblein and M. Zelen. *Journal of Research, National Bureau of Standards,* v. 57, Nov. 1956, p. 273-316.

Test data from several large manufacturers are analyzed. (Q7g, T7)

40-Q. The Influence of Design on Stress Concentration and Fatigue Failure. A. G. Gardner. *Machinery,* v. 89, Nov. 1956, p. 1061-1066.

Determination of fatigue or endurance strength; causes and alleviation of stress concentration; heat treatment stresses due to design; effect of shape on cooling speed. (Q23g, Q25k, 18-17)

41-Q. The Mechanism of Work Softening in Aluminium. Anthony Kelly. *Philosophical Magazine,* v. 1, ser. 8, no. 9, Sept. 1956, p. 835-845.

Crystals strained at one temperature and subsequently deformed at a higher temperature show a yield point (work softening); this is accompanied by an increase in the amount of cross slip and in the intensity of cross slip traces. (Q24c; Al)

42-Q. Low Temperature Release of Stored Energy in Cold Worked Copper. J. W. Henderson and J. S. Koehler. *Physical Review,* v. 104, ser. 2, Nov. 1, 1956, p. 626-633.

Pure polycrystalline copper and alpha-brass specimens were deformed in compression at temperatures near 185° C. Stored energy release during warmup was measured as function of temperature. (Q24, P12a; Cu)

43-Q. A General Theory of the Surface Friction of Solids. C. Rubenstein. *Physical Society, Proceedings,* v. 69, no. 441B, Sept. 1956, p. 921-933.

Theory is based on the assumptions that the adhesion theory of friction is valid and that the asperities, at which contact occurs, deform according to the law stress α (strain)^x. (Q9p)

44-Q. Significance of Mechanical Properties and Their Measurement. P. G. Forrest and M. J. P. Musgrave. Paper from "Chemical Engineering Practice". v. II. Academic Press. p. 68-112.

The principal means of structure determination. Tests and measurements made on solids to assess mechanical properties and to relate these properties to structure. (Q general)

45-Q. Fatigue in Metals. P. G. Forrest. Paper from "Chemical Engineering Practice". v. II. Academic Press. p. 176-208 + 2 plates.

Characteristics of fatigue failures, test methods and equipment, fatigue strength of metals, influence of stress conditions, size, surface finish and temperature, and corrosion fatigue. (Q7, Q23g, R1e)

46-Q. Creep in Metals. P. G. Forrest. Paper from "Chemical Engineering Practice". v. II. Academic Press. p. 209-241 + 1 plate.

Characteristics and measurement of creep, presentation of creep data, creep strength of ferrous and nonferrous metals, influence of metallurgical factors, stress and corrosion. (Q3, Q23d)

47-Q. (Dutch.) **A Kinematic Picture of Fracture.** J. Leeuwerik. *Metalen,* v. 11, no. 20, Oct. 31, 1956, p. 446-450.

Mechanism of fracture with ultrasonic shock waves, while traces were formed by transverse waves, in polymethylmethacrylates, glass and quartz. (Q26)

48-Q. (German.) **Electron Microscope Studies of Fractured Steel Surfaces.** Otto Werner and Johanna Hunger. *Archiv für das Eisenhüttenwesen,* v. 27, no. 10, Oct. 1956, p. 645-656.

Notch bending specimens of unalloyed structural steels were examined at time of receipt, in the normalized and aged state. Explanation of underlying structures on fractured surfaces of brittle broken crystallites. (Q26, M21e; ST)

49-Q. (German.) **Experimental Data and Suggestions for Impact Testing.** W. Spath. *Radex Rundschau,* no. 7, Oct. 1956, p. 327-333.

Designs and impact diagram from simultaneous measurement of the impact energy and the maximum stress. (Q6)

50-Q. (German.) **Determination of Residual Stress in Aluminum, Silumin, and Brass Hollow Cylinders After Expansion.** Hans Bühler, Albrecht Häfele and Arnold Peiter. *Zeitschrift für Metallkunde,* v. 47, no. 10, Oct. 1956, p. 664-671.

Measured and computed stresses show complete qualitative correspondence in the elastoplastic range and also agree well enough quantitatively. (Q25h; Al, Cu)

51-Q. (Polish.) **The Effects of Wire Plasticity on the Fatigue Strength of Steel Wire Rope.** Zygmunt Glowacki. *Hutnik,* v. 23, no. 9, Sept. 1956, p. 336-339.

Annealing steel wire after the last drawing operation improves the mechanical properties of the wire and the rope made of it.
(Q23g, J23; ST, 4-11)

52-Q. (Russian.) **On the Nature of the Reversible Temper Brittleness in Structural Steels.** S. F. Iur'ev. *Metallovedenie i Obrabotka Metallov,* no. 10, Oct. 1956, p. 37-51 + 2 plates.

Principal features of reversible temper brittleness in structural steels, intergranular development of the process, and its kinetic properties in a chilled steel. (Q23p; ST)

53-Q. (Russian.) **The Effect of Deformation Rate on the Ductility of Hardened Steel.** S. S. Shurakov. *Metallovedenie i Obrabotka Metallov,* no. 10, Oct. 1956, p. 57-63.

Tests performed on steel Z x 13 and 12 x 2 H_4A, show that ductility in hardened steels increases with a higher rate of deformation; brittleness is lessened.
(Q23p, Q24, 3-17; AY)

54-Q. **Hydrogen Embrittlement of Cold Worked Metals.** R. L. Mills and F. J. Edeskuty. *Chemical Engineering, Progress,* v. 52, Nov. 1956, p. 477-480.

Evaluation of specimens subjected to high-pressure hydrogen at room temperature. (Q26s; AY)

55-Q. **The Relation During Creep Between Grain-Boundary Sliding, Sub-Crystal Size, and Extension.** D. McLean and M. H. Farmer. *Institute of Metals, Journal,* v. 85, Oct. 1956, p. 41-50.

Grain-boundary sliding was found to be approximately proportional to elongation, a slight deviation occurring in the case of copper. Relationship with subcrystal diameter was not confirmed.
(Q3, M27f; Al, Cu)

56-Q. **Calculation of the Contribution Made by Grain-Boundary Sliding to Total Tensile Elongation.** H. Brunner and N. J. Grant. *Institute of Metals, Journal,* v. 85, Oct. 1956, p. 77-80.

Severe stress concentrations occur at the triple points whenever grain-boundary sliding takes place. An equation is derived which permits calculation of the elongation of a tensile specimen caused by sliding along any particular grain boundary.
(Q27, M27f; Al)

57-Q. **A New Approach to Hot Tearing.** C. F. Christopher. *Journal of Metals,* v. 8, Dec. 1956, p. 1654-1657.

Impact tests and microscopic examination show that the hot tearing tendency exists in a narrow temperature range and is primarilly affected by the heterogeneous freezing point of the metals. (Q26q)

58-Q. **The Fundamental Slip Process in the Torsion of a Crystal Having a Single Active Slip Plane.** A. D. Whapham and H. Wilman. *Royal Society, Proceedings,* v. 237, ser. A, Nov. 20, 1956, p. 513-529 + 2 plates.

The main deformation process in the torsion of cylindrical zinc crystals consists of flexural rotational slip on (0001), when ϕ is up to 62° and probably more. This accounts for the observed saddle-like shape of the slip lamellae, and the rounded-triangular cross-section developed by the rod. (Q24a; Zn)

59-Q. (English.) **Study on High Strength Cast Iron.** Ichiro Iitaka and Kokichi Nakamura. *Castings Research Laboratory, Report, Waseda University,* 1956, no. 7, p. 13-15.

Relation between chemical composition and strength and hardness. (Q23n, Q23a, 2-10; CI)

60-Q. (English.) **The Effects of Strain Rate and Temperature on the Mechanism of Metals to Compression.**

Yuji Matsuura. *Castings Research Laboratory, Report, Waseda University,* 1956, no. 7, p. 51-54.

Compression tests on 99.99% aluminum. (Q28, 2-11, 3-17; Al)

61-Q. (English.) **Fatigue of Carbon Steel by Ultrasonic Flaw Detection Method.** Hiroshi Yamanouchi and Takeshi Inukai. *Castings Research Laboratory, Report Waseda University,* 1956, no. 7, p. 55-58.

The values of the ultrasonic attenuation constant in mild steel under fatigue test vary with repeated stress intensity and stress cycle. These values increase in proportion to stress cycle, but a transition point exists on the curve. (Q7, S13g; CN)

62-Q. (English.) **Wear Properties of 60:40 Brass Containing Lead.** Fusao Hayama. *Castings Research Laboratory, Report, Waseda University,* 1956, no. 7, p. 81-82.

Variation of wear rate with speed, pressure and lead content. (Q23f; Cu, Pb)

63-Q. (English.) **The Fatigue Strength at Fluctuating Tension of Single Lap Joints of Clad 24 S-T and 75 S-T Aluminum Alloy With 2 Rows of 17 S Rivets.** A. Hartman and W. Klaassen. *Nationaal Luchtvaartlaboratorium, Rapport NLL-TNM* 2011, July 1956.

Fatigue strength of the 24 S-T alclad sheet was superior. (Q23g; Al, 8-16)

64-Q. (Dutch.) **A Theoretical Interpretation of Fracture.** F. Schwarzl. *Metalen,* v. 11, no. 21, Nov. 1956, p. 470-476.

Fracture in metal was studied in relation to the order of magnitude of the ultimate stress and cohesion energy, the influence of nonhomogeneous factors on strength, the statistical character of the ultimate stress, and time. (Q26)

65-Q. (French.) **Tensile Testing of Aluminum Alloy Castings Using Standardized Specimens on the Chevenard Micromachine.** C. Mascré. *Métaux, Corrosion-Industries,* v. 31, no. 374, Oct. 1956, p. 385-395.

Two types of tensile test specimens were proposed for standardization and comparison with classic specimens, and some mechanical characteristics of castings were examined. (Q27a, Al5)

66-Q. (German.) **Long-Time Creep Properties of Pure and Low Alloyed Copper. (Literature Review II.)** H. Vosskühler. *Metall,* v. 10, no. 21-22, Nov. 1956, p. 1020-1022.

Data for various copper alloys. (Q23d; Cu)

67-Q. (German.) **Stress Field of a Concentrated Load at the End of an Infinite Plate With an Elastic Anisotropy.** Hans H. Stadelmaier, *Zeitschrift für Angewandte Mathematik und Physik,* v. 7, no. 5, Sept. 1956, p. 393-402.

Periodic loading effects discussed and compared with an existing observation of a nonuniform stress distribution in α-iron. (Q25r; Fe)

68-Q. (Hungarian.) **Aluminum of Internationally Accepted Standard Quality. Hungarian Production Results in 1955.** Andras Domony, Robert Vassel and Janos Déry. *Kohaszati Lapok,* v. 11, no. 8, Aug. 1956, p. 369-377.

Review of laboratory and industrial experiments for the improvement of the properties of electrically conductive aluminum wire. Effects of production methods on properties. (Q general, P15g; Al)

69-Q. (Hungarian.) **Fatigue Tests of Aluminum Alloys and Their Welded Joints.** Istvan Varga. *Kohaszati Lapok,* v. 11, no. 8, Aug. 1956, p. 377-380.

Factors effecting fatigue. Optimum welding materials and procedures. (Q7, K1; Al, 7-1)

70-Q. (Russian.) **Studies of Cohesive Forces in Iron-Molybdenum Solid Solutions From Fine Structure X-Ray Absorption Spectra.** V. A. Trapetsnikov and S. A. Nemnonov. *Fizika Metallov i Metallovedenie,* v. 3, no. 2, 1956, p. 314-320.

Alloying iron with 2% molybdenum increases the cohesive forces; from 2% to 4% molybdenum there is no further change. (Q23n, M22g; Fe, Mo, 2-10)

71-Q. (Russian.) **The Elasticity and Plasticity Limits of Some Metals at the Temperature of Liquid Helium.** V. I. Khotkevich. *Fizika Metallov i Metallovedenie,* v. 3, no. 2, 1956, p. 321-325.

Thallium, indium, mercury, lead, copper, magnesium, aluminum, cadmium, tin, silver, gold, platinum, nickel, molybdenum, tantalum and iron are still plastic at the temperature of liquid helium. The electrical resistance of the metal was used to determine degree of plastic deformation of the specimen. (Q21, Q23, 2-13)

72-Q. (Russian.) **The Effects of Frequency and Amplitude of Alternating Cyclic Torsion on the Maximum Plasticity of Metals and Certain Alloys.** F. P. Rybalko, G. V. Miroliubov

and N. N. Siutkin. *Fizika Metallov i Metallovedenie,* v. 3, no. 2, 1956, p. 341-348.

Maximum plasticity of copper, lead, tin, brass, zinc, aluminum and its zinc alloys decreases with the amplitude of the deformation. Increasing the frequency of the cycles increases the plasticity of the metals, while in the alloys it depends on the relationship of the components. (Q22n, Q23; Cu, Pb, Sn, Zn, Al)

73-Q. (Russian.) **The Size Effect in Studying Friction and Wear in Metals.** V. I. Bondar'. *Fizika Metallov i Metallovedenie,* v. 3, no. 2, 1956, p. 363-368.

A study of factors to be considered when making wear and friction tests. Effects of changing shape and size of specimens on the results obtained. (Q9n, Q9p)

74-Q. (Russian.) **Wear Produced by Mutual Rubbing of Similar Metals.** V. N. Kashcheev. *Fizika Metallov i Metallovedenie,* v. 3, no. 2, 1956, p. 369-373.

The body which reaches the higher temperature during the application of friction wears more slowly. The process is characterized by binding and the formation of a roughened surface. (Q9, Q23f)

75-Q. (Russian.) **Hardness and Microhardness of Ferritic Cast Iron.** K. I. Vashchenko, R. P. Todorov, and P. A. Varenik. *Liteinoe Proizvodstvo,* 1956, no. 10, Oct. 1956, p. 19-23.

Investigation of hardness of gray and manganese cast irons and silicon steel. (Q23a; ST, CI)

76-Q. (Russian.) **Hydrogen Effect on Mechanical Properties of Steel.** P. V. Skiuev, L. I. Kvater and V. E. Shapiro. *Stal',* v. 16, no. 10, Oct. 1956, p. 909-915.

Effect of hydrogen on plasticity and ductility of steel in relation to its chemical composition, strength, structure and testing temperature. (Q23; ST, H)

77-Q. (Russian.) **The Problem of Laminated Woody Fracture.** I. S. Kaptiug. *Stal',* v. 16, no. 11, Nov. 1956, p. 1021-1025.

A critique of the works of several authors on the subject, citing errors made and some of the criteria for a correct evaluation. (Q26; ST)

78-Q. (Russian.) **Chemical Analysis of Surface Layers of Metals Exposed to Various Types of Wear.** B. I. Kostetskii, N. L. Golego and P. K. Topekha. *Vestnik Mashinostroeniia,* v. 36, no. 10, Oct. 1956, p. 25-26.

The role of oxygen in the hard, white surface formations of steel exposed to certain friction conditions. (Q23f, 2-10; ST)

79-Q. (Russian.) **Mechanical Properties of Steel After Impregnating Its Surface with Chromium.** G. N. Dubinin. *Vestnik Mashinostroeniia,* v. 36, no. 10, Oct. 1956, p. 56-58.

Chromium plating steel increases its long-time strength 40 to 50 times and increases fatigue strength at high temperatures. (Q23; Cr, ST, 8-12)

80-Q. (Swedish.) **Brittle Fracture in Mild Steel.** Per Matton Sjöberg. *Jernkontorets Annaler,* v. 140, no. 10, 1956, p. 759-811.

Influence of the critical strain accelleration on cleavage of ferrite. Impact test at low energy levels. Initiation and propagation of brittle fracture. Relationship between crack propagation and elastic-plastic wave propagation. Influence of residual stresses, analysis, microstructure. (Q26; CN)

81-Q. (Book.) **Fatigue of Metals and Structures.** H. J. Grover, S. A. Gordon, and L. R. Jackson, 399 p. 1956. Academic Press, Thames and Hudson, London W.C.1, England.

Directed particularly to the designer or engineer with some knowledge of, but limited practical experience, in fatigue problems. It is intended to provide references to published literature for more complete information on the most important items. (Q7, Q23g)

82-Q. **Allowance for Stress Concentration in Design to Prevent Fatigue.** Horace J. Grover. Paper from "International Conference on Fatigue of Metals". v. I. Institution of Mechanical Engineers. 9 p.

Evidence for effective stress-concentration factors was derived from laboratory tests on specimens with simple geometrical discontinuities under various load conditions. (Q7g, Q25k)

83-Q. **An Analysis of the Effects of Shot-Peening Upon the Fatigue Strength of Hardened and Tempered Spring Steel.** A. G. H. Coombs, F. Sherratt and J. A. Pope. Paper from "International Conference on Fatigue of Metals". v. I. The Institution of Mechanical Engineers. 10 p. + 4 plates.

Effects of shot velocity, energy and size on fatigue life. (Q23g, G23n; CN, SGA-b)

84-Q. **The Basic Mechanism of Fatigue and Its Dependence on the In-**

itial State of a Material. P. J. E. Frosyth. Paper from "International Conference on Fatigue of Metals". v. II. The Institution of Mechanical Engineers. 5 p. + 2 plates.

The microscopic changes or damage which precede the formation of fatigue cracks and the changes which occur in the small volume of material at the tip of the crack when propagating are illustrated in pure and alloyed aluminum. (Q23g, Q26q; Al)

85-Q. The Behaviour of Single Crystals of Iron Under Fatigue Loading. H. A. Lipsitt and G. T. Horne. Paper from "International Conference on Fatigue of Metals". v. II. The Institution of Mechanical Engineers. 9 p. + 2 plates.

The range of stresses which will cause fatigue failure in less than 2 x 10^7 cycles in single crystals of nominally pure iron tested in axial tension-compression is very narrow. Deformation characteristics are similar to those in static tension, except that cross slip is more prevalent in fatigue. (Q7; Fe, 1-4)

86-Q. Cumulative Damage Under Random Loading. A. M. Freudenthal. Paper from "International Conference on Fatigue of Metals". v. I. The Institution of Mechanical Engineers. 7 p.

Random fatigue testing machine; tests on 2024 and 7075 aluminum alloys. (Q7; Al)

87-Q. Cumulative Fatigue Damage. H. T. Corten and T. J. Dolan. Paper from "International Conference on Fatigue of Metals". v. I. The Institution of Mechanical Engineers. 14 p.

A phenomenological hypothesis of fatigue damage, visualized as the nucleation of submicroscopic voids which develop into cracks, is given in terms of the number of damage nuclei and the rate of damage propagation. (Q26q)

88-Q. Damping and Resonant Fatigue Behaviour of Materials. B. J. Lazan. Paper from "International Conference on Fatigue of Metals". v. I. The Institution of Mechanical Engineers. 14 p.

The general role of material damping in minimizing near-resonant fatigue stress is analyzed by developing criteria based on material properties and stress distribution for evaluating the resonant fatigue strength of parts. (Q23q, Q8k)

89-Q. The Distinction Between Initiation and Propagation of a Fatigue Crack. John A. Bennett. Paper from "International Conference on Fatigue of Metals". v. II. The Institution of Mechanical Engineers. 5 p. + 3 plates.

Distinction may be difficult to make when the cracks are small, and any nondestructive method for identifying cracks should be verified by metallographic examination of sections cut through the questionable markings. (Q26q)

90-Q. Distribution Functions for the Prediction of Fatigue Life and Fatigue Strength. A. M. Freudenthal and E. J. Gumbel. Paper from "International Conference on Fatigue of Metals". v. I. The Institution of Mechanical Engineers. 12 p.

Fatigue theories and scatter of fatigue strength and life; boundary conditions; distribution of fatigue life at constant stress amplitude and fatigue strength at constant number of cycles; fatigue life-fatigue strength relation. (Q23g)

91-Q. Effect of Fatigue Stresses on Creep and Recovery. A. J. Kennedy. Paper from "International Conference on Fatigue of Metals". v. II. The Institution of Mechanical Engineers. 9 p.

Creep of lead under static stress with superimposed fatigue stresses. Effect of a fatigue vibration on the recovery properties of work hardened metals. (Q23d, Q23g, Pb)

92-Q. Effect of Large Hydrostatic Pressures on the Torsional Fatigue Strength of an Alloy Steel. B. Crossland. Paper from "International Conference on Fatigue of Metals". v. I. The Institution of Mechanical Engineers. 14 p.

Fluid pressure has no effect on the stress-strain curve except to increase the strain to failure by about 80% at 20 tons per sq.in. pressure. (Q23g, 3-24; AY)

93-Q. The Effect of Mean Stress on the Fatigue of Aluminium Alloys. A. R. Woodward, K. W. Gunn and G. Forrest. Paper from "International Conference on Fatigue of Metals". v. I. The Institution of Mechanical Engineers. 16 p.

Fatigue properties of seven alloys; stress-mean stress diagrams; application of several theories to behavior or the alloys tested. (Q23g, 3-16; Al)

94-Q. The Effect of Mean Stress on the Push-Pull Fatigue Properties of an Alloy Steel. H. C. O'Connor

and J. L. M. Morrison. Paper from "International Conference on Fatigue of Metals". v. I. The Institution of Mechanical Engineers. 10 p.

The limiting safe range of stress was investigated for mean stresses varying from 30 tons per sq.in. compression to 37½ tons per sq.in. tension. There is a linear relation between the safe range of stress and the mean stress for all ranges of stress in which the lower static yield is not exceeded. (Q23g, 3-16; AY)

95-Q. Effect of Unintentional Stress Raisers on the Fatigue Strength of Structural Components. E. C. Hartmann. Paper from "International Conference on Fatigue of Metals". v. I. The Institution of Mechanical Engineers. 8 p.

The final effect of many unintentional discontinuities on the fatigue strength of finished parts is found to be entirely negligible. (Q23g)

96-Q. Effect of Variable Load and Cumulative Damage on Fatigue in Vehicle and Airplane Structures: The Fatigue Strength of Vehicle and Aircraft Components. E. Gassner. Paper from "International Conference on Fatigue of Metals". v. I. The Institution of Mechanical Engineers. 8 p.

Results of practical-vehicle-running and laboratory-program tests compared. (Q23g, Q7, S21)

97-Q. Experiments Relating to the Basic Mechanism of Fatigue. N. Thompson. Paper from "International Conference on Fatigue of Metals". v. II. The Institution of Mechanical Engineers. 6 p. + 4 plates.

Stages in the development of a fatigue crack in a single crystal of copper and in polycrystalline nickel. (Q26q; Cu, Ni)

98-Q. Failure of Metals Under Cyclic Strain. W. A. Wood. Paper from "International Conference on Fatigue of Metals". v. II. The Institution of Mechanical Engineers. 6 p.

An interpretation of the fatigue property is based on study of the structural changes peculiar to fatigue. (Q23g)

99-Q. The Fatigue Behaviour of Iron With Intergranular Weakness. H. R. Tipler and P. G. Forrest. Paper from "International Conference on Fatigue of Metals". v. II. The Institution of Mechanical Engineers. 5 p.

Tests reveal an unusual type of fatigue failure in iron having exceptionally weak grain boundaries. (Q23g, M27f; Fe)

100-Q. Fatigue Endurance of Large Parts With Electro-Slag Welds. E. P. Unksov. Paper from "International Conference on Fatigue of Metals". v. III. The Institution of Mechanical Engineers. 8 p. + 4 plates.

Fatigue endurance of welded joint without heat treatment and with reinforcement left intact is lower than that of unwelded samples. Heat treatment increased endurance by 30-35%. Mechanical treatment with no reinforcement was extremely favorable. (Q23g; 7-1)

101-Q. Fatigue of Curved Surfaces in Contact Under Repeated Load Cycles. N. G. Kennedy. Paper from "International Conference on Fatigue of Metals". v. I. The Institution of Mechanical Engineers. 10 p. + 4 plates.

Tests suggest that damage to the surface of curved elastic pairs in contact under cyclic loading stems from surface conditions at the boundary of the area of contact. (Q7)

102-Q. Fatigue of Metals Under Contact Friction. I. A. Oding and V. S. Ivanova. Paper from "International Conference on Fatigue of Metals". v. II. The Institution of Mechanical Engineers. 8 p.

Reduction in fatigue limit in conditions of contact friction can be explained by the process of electric erosion that proceeds under the action of a thermo-electric current produced as a result of friction, and which pulsates in magnitude because of a variation in the resistance of the contact. (Q23g, Q23f)

103-Q. Fatigue of Plain Bearings. W. E. Duckworth and G. H. Walter. Paper from "International Conference on Fatigue of Metals". v. III. The Institution of Mechanical Engineers. 10 p. + 2 plates.

Mechanism of fatigue, determination of fatigue strength, factors influencing fatigue strength, relation between thickness and strength of linings, stress analysis, influence of backing materials. (Q23g; SGA-c)

104-Q. Fatigue of Wrought High-Tensile Alloy Steels. P. H. Frith. Paper from "International Conference on Fatigue of Metals". v. II. The Institution of Mechanical Engineers. 41 p.

Includes 287 fatigue results for various types or combinations of reversed stress. (Q23g; AY)

105-Q. The Fatigue Problem in Welded Construction. R. Weck. Paper from "International Conference on Fatigue of Metals". v. III. The Institution of Mechanical Engineers. 11 p. + 4 plates.

Some general considerations, fatigue in welds and joints, metallurgical aspects and welding processes, residual stress, service experience and failures. (Q23g, K1; 7-1)

106-Q. Fatigue Properties of Some Nonferrous Metals Excluding Light Alloys. J. McKeown. Paper from "International Conference on Fatigue of Metals". v. II. The Institution of Mechanical Engineers. 9 p.

Lead and lead alloys, copper and its alloys, metals for sleeve bearings, coating metals.
(Q23g; SGA-c, Pb, Cu)

107-Q. Fatigue Properties of Steel at High Temperatures. F. Wever. Paper from "International Conference on Fatigue of Metals". v. II. The Institution of Mechanical Engineers. 7 p. + 2 plates.

Fatigue strength and mean stress, stress fracture times for static and alternating loading, notch effect and surface hardening, metallographical investigations. (Q23g, 2-12; ST)

108-Q. Fatigue. Residual Stresses and Surface Cold Working. R. L. Mattson. Paper from "International Conference on Fatigue of Metals". v. III. The Institution of Mechanical Engineers. 13 p. + 2 plates.

Experimental data illustrate the importance of these problems.
(Q23g, Q25h, 3-18)

109-Q. Fatigue Strength in Shear of an Alloy Steel With Particular Reference to the Effect of Mean Stress and Directional Properties. W. T. Chordorowski. Paper from "International Conference on Fatigue of Metals". v. I. The Institution of Mechanical Engineers. 12 p. + 2 plates.

Tests under torsional fatigue stresses on longitudinal oblique, and transverse specimens.
(Q23g, 3-16, 3-22; AY)

110-Q. Fatigue Testing of Compression-type Coil Springs. R. C. Coates and J. A. Pope. Paper from "International Conference on Fatigue of Metals". v. III. The Institution of Mechanical Engineers. 15 p.

Spring fatigue testing machines. Effects of shot-peening, scragging, scragging and peening and mean stress. (Q7b; SGA-b)

111-Q. Fatigue Tests on Seamless Mild-Steel Pipe Bends. P. H. R. Lane. Paper from "International Conference on Fatigue of Metals". v. III. The Institution of Mechanical Engineers. 10 p. + 2 plates.

Specimens were subjected to pulsating internal pressure and to alternating external loading in the plane of the bend. (Q7; CN, 4-10)

112-Q. Further Results of Fatigue Under Triaxial Stress. J. S. C. Parry. Paper from "International Conference on Fatigue of Metals". v. I. The Institution of Mechanical Engineers. 8 p.

The low critical shear stress previously found for the fatigue limit for unprotected cylinders subjected to repeated internal pressures appears little affected by wide variation of tri-axial tensile stress or fluid pressure. Strength can be raised by honing the bore after heat treatment or by protecting the bore from the fluid by a thin film or rubber. (Q7e)

113-Q. The Growth of Fatigue Cracks Under Plastic Torsion. F. A. McClintock. Paper from "International Conference on Fatigue of Metals". v. II. The Institution of Mechanical Engineers. 7 p. + 2 plates.

Theoretical analysis and experiments with an aluminum alloy.
(Q7, Q26q; Al)

114-Q. Hardness Changes During Fatigue Tests on Copper. R. B. Davies, J. Y. Mann and D. S. Kemsley. Paper from "International Conference on Fatigue of Metals". v. II. The Institution of Mechanical Engineers. 8 p.

Progressive hardness changes during fatigue, hardness traverses along fractured specimens, metallographic examination. (Q23a, Q7; Cu)

115-Q. Hydrogen Occlusion and Its Effect on the Fatigue Properties of Plain Carbon Spring Steels. J. S. Jackson. Paper from "International Conference on Fatigue of Metals". v. II. The Institution of Mechanical Engineers. 8 p.

Conditions of steel which tend to lower the ductility are more prone to the damaging effects of hydrogen

occlusion. Occluded hydrogen has very little effect on the fatigue limit of cold-worked spring steels but can cause a marked falling off in resistance to fatigue at stress ranges above the fatigue limit. (Q23g, CN, H, SGA-b)

116-Q. The Influence of Frequency of Vibration on the Endurance Limit of Ferrous Alloys at Speeds up to 150,000 Cycles Per Minute Using a Pneumatic Resonance System. T. W. Lomas, J. O. Ward, J. R. Rait and E. W. Colbeck. Paper from "International Conference on Fatigue of Metals". v. II. The Institution of Mechanical Engineers. 13 p.

There is a definite influence of frequency on the endurance limit of a wide range of materials when tested in resonance. The pneumatic technique appears to be very sensitive to notches. (Q23g; Fe, ST)

117-Q. Influence of Plastic Deformation on Notch Sensitivity in Fatigue. P. G. Forrest. Paper from "International Conference on Fatigue of Metals". v. I. The Institution of Mechanical Engineers. 15 p.

The dynamic plastic strain per cycle varies during the course of a fatigue test for most of the materials investigated. Measurements afford no evidence that failure by fatigue is inseparably associated with plastic deformation. (Q7, 3-18)

118-Q. Influence of Residual Stresses on tne Fatigue Limit. H. Sigwart. Paper from "International Conference on Fatigue of Metals". v. I. The Institution of Mechanical Engineers. 12 p.

Nature of residual stresses including stresses due to local plastic deformations, unequal heating and unequal stress distribution. Some examples of residual stresses. Effect of stresses on fatigue properties. (Q23g, 3-16)

119-Q. The Influence of Some Surface Factors on the Torsional Fatigue Strength of Spring Steels. J. F. Watkinson. Paper from "International Conference on Fatigue of Metals". v. II. The Institution of Mechanical Engineers. 16 p. + 4 plates.

Shot peening improves fatigue strength of quenched and tempered spring steel in both the polished and the heat treated conditions. Decarburization reduces the residual stresses present after peening and markedly reduces the fatigue strength of the shot-peened specimens. (Q23g, G23n; CN)

120-Q. The Influence of Temperature on the Fatigue of Metals. N. P. Allen and P. G. Forrest. Paper from "International Conference on Fatigue of Metals". v. II. The Institution of Mechanical Engineers. 16 p. + 3 plates.

Fatigue of copper, mild steel and some technical creep-resisting alloys; fatigue under fluctuating stresses at high temperature; correlation of creep strength and fatigue strength; influence of metallographic structure and corrosion. (Q23g, Q23f, 2-11; Cu, CN)

121-Q. Interpretation of Fatigue Strengths for Combined Stresses. Joseph Marin. Paper from "International Conference on Fatigue of Metals". v. I. The Institution of Mechanical Engineers. 13 p.

Development of theory for predicting fatigue strength of materials under combined states of stress. Comparisons with test data. (Q7f)

122-Q. Mechanical Aspect of Size Effect on Fatigue of Metals. G. V. Uzhik. Paper from "International Conference on Fatigue of Metals". v. I. The Institution of Mechanical Engineers. 6 p.

Discontinuity of the material itself is not likely to decisively affect the fatigue strength under a size increase. (Q23g, 3-23)

123-Q. Metallographic Observations on the Fatigue of Steels. H. Hempel. Paper from "International Conference on Fatigue of Metals". v. II. The Institution of Mechanical Engineers. 7 p. + 15 plates.

Formation of slip markings and propagation of cracks at room temperature; formation of twin crystals at low temperature. (Q23g, Q26p, M27e; ST)

124-Q. On the Endurance of Cast Iron and Steel Under Repeated Loading of Varying Amplitude. S. W. Serensen. Paper from "International Conference on Fatigue of Metals". v. I. The Institution of Mechanical Engineers. 9 p.

Fatigue curves were statistically treated, taking into account the large scattering of test data, and correlation equations between the stress amplitude and number of cycles were determined. (Q7; ST, CI)

125-Q. The Influence of Fillet Radius on the Fatigue Strengths of Large Steel Shafts. S. F. Dorey and

G. P. Smedley. Paper from "International Conference on Fatigue of Metals". v. I. The Institution of Mechanical Engineers. 12 p. + 2 plates.

Results of full-scale torsional fatigue tests. (Q7, ST)

126-Q. The Reactions of High-Strength Aluminium Alloys to Alternating Stresses. R. F. Hanstock. Paper from "International Conference on Fatigue of Metals". v. II. The Institution of Mechanical Engineers. 9 p. + 2 plates.

The fatigue process, dynamic properties of aluminum alloys, nature of the changes in hysteresis induced by prolonged cyclic stresses, differences between the effects of thermal treatment and cyclic stressing, precipitation produced by cyclic stressing. (Q7e; Al)

127-Q. Relation of Inclusions to the Fatigue Properties of High-Strength Steels. F. B. Stulen, H. N. Cummings and W. C. Schulte. Paper from "International Conference on Fatigue of Metals". v. II. The Institution of Mechanical Engineers. 8 p.

Fatigue life and strength of high-strength steels, heat treated to a given ultimate tensile strength, depend largely on the size and location of inclusions. (Q23g, 9-19; AY)

128-Q. Short Endurance Fatigue. A. C. Low. Paper from "International Conference on Fatigue of Metals". v. I. The Institution of Mechanical Engineers. 8 p.

For the five widely differing materials tested, with tensile strengths varying from 21 to 57 tons per sq. in., but all with good ductility, fatigue life in reversed bending was found to depend solely on the degree of strain, for maximum fiber strains between ±0.4% and ±5%. (Q7b)

129-Q. Some Preliminary Fatigue Results on a Steel of up to 800 V. P. N. Hardness Using Notched and Unnotched Specimens. J. E. Russell and D. V. Walker. Paper from "International Conference on Fatigue of Metals". v. II. The Institution of Mechanical Engineers. 5 p.

There is no confirmation of the theory that low fatigue ratios for very high tensile steel are due to lower tempering temperature. No significant improvement in fatigue properties is noted for carbon contents above 0.5%. Tendency of notch susceptibility to fall with increasing hardness above Vickers 400 is confirmed. (Q7; ST)

130-Q. Strength Reduction Factors for Small Quenching Cracks and for Decarburized Steel. J. A. Pope and C. W. Barson. Paper from "International Conference on Fatigue of Metals". v. II. The Institution of Mechanical Engineers. 8 p. + 2 plates.

Heavy decarburization is more detrimental to the fatigue strength of the silicon-manganese steel tested than the small quenching cracks induced. Overstrain has no beneficial effect upon the quenching cracks. (Q23g, J4a; ST, 9-22)

131-Q. Stress Concentration in Relation to Fatigue. H. L. Cox. Paper from "International Conference on Fatigue of Metals". v. I. The Institution of Mechanical Engineers. 12 p. + 2 plates.

The present state of knowledge of stress concentration in relation to needs of designer. (Q23g, Q25k)

132-Q. Studies in the Formation and Propagation of Cracks in Fatigue Specimens. N. E. Frost and C. E. Phillips. Paper from "International Conference on Fatigue of Metals". v. II. The Institution of Mechanical Engineers. 9 p. + 4 plates.

The existence and formation of nonpropagating cracks in notched specimens subject to fatigue loading; conditions necessary to form nonpropagating cracks and their effects on notch sensitivity; strength reduction factors of cracks; crack propagation. (Q26q, Q7a)

133-Q. A Study of the Strain Cycling and Fatigue Behaviour of a Cold-Worked Metal. L. F. Coffin and J. H. Read. Paper from "International Conference on Fatigue of Metals". v. II. The Institution of Mechanical Engineers. 12 p.

The strain softening of AISI 347 stainless steel is examined as a function of degree of prior cold work and temperature.
(Q23g, 3-18, 2-11; SS)

134-Q. Theory for Combined Bending and Torsion Fatigue With Data for SAE 4340 Steel. W. N. Findley, J. J. Coleman and B. C. Hanley. Paper from "International Conference on Fatigue of Metals". v. I. The Institution of Mechanical Engineers. 10 p.

Mathematical formulation of the effect of a normal stress acting on the critical shear plane. Comparisons with experimental data. (Q7b; AY)

135-Q. Very High-Speed Fatigue Testing. A. R. Wade and P. Grootehuis. Paper from "International Conference on Fatigue of Metals". v. II. The Institution of Mechanical Engineers. 11 p.

Choice of type of high-speed machine, calculation of stress, fatigue tests. (Q7)

136-Q. (English.) **Hardness of Spherodial Graphite Cast Iron Containing Various Amouts of Ferrite.** Takaji Kusakawa and Toyoharu Kasai. *Castings Research Laboratory, Report, Waseda University,* 1956, no. 7, p. 7-12.

Rockwell and Brinell hardness is first increased, then decreased, by addition of silicon, and is rapidly increased by magnesium treatment. Hardness of ferrite phase is higher than that in flake graphite iron. (Q23a, 2-10; CI)

137-Q. Physical Properties of Zirconium. A. D. Schwope. Paper from "Zirconium—Technology and Economics". Atomic Industrial Forum, p. 35-37. (CMA)

The thermal creep, fatigue, impact, galling and strength properties of zirconium surveyed. Concluded that thermal stress is 1/6th that generated in stainless steel, that cold working increases the creep resistance, that zirconium is more sensitive to strain rate than iron, and that working and α annealing should be used when the metal has been heated in the β region. Solid lubricants reduce friction more effectively than liquids. (Q23, 3-18; Zr)

138-Q. Australian Work on Aircraft Fatigue and Life Evaluation. F. H. Hooke and P. S. Langford. *Aircraft Engineering,* v. 28, Dec. 1956, p. 408-414.

Cases of failure due to fatigue of metal parts. Past, present and future research in aircraft structural fatigue discussed. 15 ref. (Q23g, T24)

139-Q. Creep Deflexion of Magnesium Alloy Struts. A. E. Johnson, V. D. Mathur and J. Henderson. *Aircraft Engineering,* v. 28, Dec. 1956, p. 419-425.

Report on research into properties of magnesium alloy struts at room temperature. Object was to predict the creep deflection of magnesium alloy struts from tensile creep data. (Q23e; Mg)

140-Q. Adhesive-Bonded Joints Tested by Ultrasonics. E. L. Gray. *American Machinist,* v. 100, no. 27, Dec. 17, 1956, p. 122-125.

Mechanical-impedance methods of testing for inspectiing both metal-to-metal and sandwich bonded panels. Voids and in some cases substandard bonds can be detected. (Q10c)

141-Q. Buckling of Tapered Plates in Compression. Bertram Klein. *Aircraft Engineering,* v. 28, Dec. 1956, p. 427-430.

General equation has been derived for calculating the buckling load of tapered plates that have an axis of symmetry and are symmetrically loaded about this axis. (Q28, 4-3)

142-Q. Effect of Cerium on the Mechanical Properties of a Cast Titanium Alloy. H. W. Antes and R. E. Edelman. *Foundry,* v. 85, Jan. 1957, p. 116-119. (CMA)

The effect of cerium additions on cast grain size and mechanical properties of Ti-6Al-4V was studied; two heat treatments were used. Cerium up to 0.42% was added and is found to decrease strength and ductility, due to a cerium-rich phase at the grain boundaries; grain size is reduced but no benefit from the reduction was apparent. Impact fractures were found to vary in appearance according to the amount of cerium added. (Q general, 2-10; Ti, *Ce*)

143-Q. The Effects of Internal Oxidation on the Tensile Properties of Some Silver Alloys at Room and Elevated Temperatures. E. Gregory and G. C. Smith. *Institute of Metals, Journal,* v. 85, No. 3, Nov. 1956, p. 81-87.

Conditions affecting the production of nonmetallic phases by internal oxidation of silver alloys containing silicon or aluminum investigated. A very marked inhibition of grain growth and recrystallization obtained. Strength was dependent on the degree of dispersion of the oxide, the greatest improvement in specimens containing the finest dispersion. 13 ref. (Q23n, R2s; Ag)

144-Q. The Hardness of Manganese and Some Manganese-Rich Alloys. H. O'Neill and Vernon Griffiths. *Institute of Metals, Journal,* v. 85, No. 3, Nov. 1956, p. 105-108.

Diamond-pyramid hardness tests on electrolytic manganese and some of its dilute alloys. Hardness values of some quenched gamma alloys of manganese with copper and nickel, after various reheating treatments. (Q23a; Mn)

145-Q. A Proposed Method for Calculating Residual Stresses in Iron Rolls. Charles F. Peck, Jr. *Iron and Steel Engineer,* v. 33, No. 12, Dec. 1956, p. 121-124.

The method of computation of radial stress and longitudinal stress as residual stress in iron rolls. Data for ratio of tensile to compressive stress versus diameter of roll. (Q25h, W22, 17-7; CI)

146-Q. The Craze-Cracking of Metals. L. Northcott and H. G. Baron. *Iron and Steel Institute, Journal,* v. 184, Dec. 1956, p. 385-409.

This type of failure occurs when a surface is repeatedly heated and cooled. Previous work and present experimental methods and the results. 40 ref. (Q26q, 2-11)

147-Q. Statistical Investigation of the Fatigue Life of Deep-Groove Ball Bearings. J. Lieblein and M. Zelen. *Journal of Research, National Bureau of Standards,* v. 57, Nov. 1956, p. 273-316.

Manufacturers' pooled test data, compiled by American Standards Association and analyzed by the National Bureau of Standards. Purpose is to set up uniform ball-bearing application formulas. 21 ref. (Q23g, S12, T7d)

148-Q. Fundamentals of Wear. *Lubrication,* v. 42, Dec. 1956, p. 149-160.

Various phenomena associated with the sliding of bearing surfaces: basic processes involved and contributing effects of surface films: typical lubricant performance characteristics. 47 ref. (Q23f; SGA-c, NM-h)

149-Q. Mechanism of "Free" Rolling Friction. D. Tabor. *Lubrication Engineering,* v. 12, Nov.-Dec. 1956, p. 379-386.

It is suggested that the major source of "free" rolling friction is elastic hysteresis in the solids themselves. (Q9p)

150-Q. Concentration Effects of Cutting Oil Additives in Performance Evaluation. A. Dorinson. *Lubrication Engineering,* v. 12, Nov.-Dec. 1956, p. 387-391.

Hypothesis suggests that behavior for a particular cutting oil will depend on the relation between wear by metal contact of chip and tool, and wear by chemical reaction of the tool material with the additive. 10 ref. (Q9n, G17; NM-h)

151-Q. New Leaded Steels Reduce Machining of Large Gears. C. R. Funk. *Materials and Methods,* v. 44, no. 6, Dec. 1956, p. 94-95.

New steels, called Hi-Qua-Led, are now in production. Tensile, bend and impact properties remain the same, but the lubricating action of lead permits faster speeds and deeper cuts in machining. (Q23, G17k; ST, *Pb*)

152-Q. Why Bolts Fail. Fred J. Poss. *Steel,* v. 139, Dec. 3, 1956, p. 125-126.

Bending stresses caused by deviation from perpendicular of nut and bolt bearing surfaces may be most common cause of failure. (Q25q, T7f)

153-Q. What Copper Alloy Forgings Can Do. Arthur I. Heim. *Steel,* v. 139, Dec. 31, 1956, p. 58-60.

Details properties and expected tolerances of hot pressed copper alloy forgings. (Q general; Cu, 4-1)

154-Q. Further Studies on the Effect of Microstructure on Notch Toughness and Fracture Morphology. J. C. Danko, J. H. Gross and R. D. Stout. *Welding Research,* v. 21, Dec. 1956, p. 604s-609s.

Influence of some types of discontinuous phases in a nominally constant ferrite matrix on the notch toughness of the aggregate. 5 ref. (Q23r, Q26, 3-21; 7-1)

155-Q. Triaxial Tension Testing and the Brittle Fracture Strength of Metals. N. Bredzs and H. Schwartzbart. *Welding Research,* v. 21, Dec. 1956, p. 610s-615s.

Data on the effect of joint thickness on tensile strength of mild steel and drill rod brazed with silver and copper. 6 ref. (Q27, Q23n; CN, 7-2)

156-Q. Fatigue of Welded Joints Committee. LaMotte Grover. *Welding Research Council Yearbook,* 1956, p. 32-33.

Studies in progress at the University of Illinois on evaluating and improving the behavior of welded members and connections which are subjected to repeated loads. (Q23g; 7-1)

157-Q. Properties of Hot-Rolled Steel Plates: Influence of Silicon and Aluminum as Deoxidizers. *Iron and*

Coal Trades Review, v. 158, Dec. 14, 1956, p. 1450.

Additions of silicon and aluminum to steels of different manganese content were studied to determine the influence of these two elements on the notched-bar properties of hot rolled steel.
(Q23; ST, 4-3, *Si, Al,* AD-r)

158-Q. Tensile Strength of Whiskers. S. S. Brenner. *Journal of Applied Physics,* v. 27, Dec. 1956, p. 1484-1491.

Tensile tests performed on whiskers of iron, copper and silver 1.2 to 15 microns in diameter. The strongest whiskers, which were less than 4 microns in diameter, exhibited resolved elastic shear strengths of from 2 to 6% of their shear moduli.
(Q23n; Fe, Cu, Ag, 14-11)

159-Q. Low-Temperature Brittleness. Charles S. Barrett. *Metal Progress,* v. 70, Dec. 1956, p. 68-72.

Interrelation between brittle fracture of ship plate and many of the physical properties which are determined by crystalline perfection.
(Q26s, 2-13, M2bs; ST, 4-3)

160-Q. Die Steel Useful for Ultra High-Strength Structural Requirements. John C. Hamaker, Jr. *Metal Progress,* v. 70, Dec. 1956, p. 93-96B.

Strength, toughness, ductility and thermal stability of a 5% chromium die steel are superior to those of any ultra high-strength structural alloy proposed for aircraft operation in the temperature range of —100 to 1000° F. (Q23; TS, SGB-s)

161-Q. Recent Studies on Ductile Molybdenum. Julius J. Harwood. *Metal Progress,* v. 70, Dec. 1956, p. 97-101.

Deoxidation practice and alloying elements improve ductility by converting the precipitates (oxides, nitrides and carbides) into innocuous forms, by affecting the solubility relationships of the interstitial impurities, and by altering the kinetics of the aging process.
(Q23p, C25; Mo, 9-1)

162-Q. Fe-Al-Mo Alloys for High-Temperature Use. J. F. Nachman and W. J. Buehler. *Metal Progress,* v. 70, Dec. 1956, p. 107-110.

The light weight, excellent oxidation resistance and high strength at elevated temperatures of iron-aluminum-molybdenum alloys indicate their potential utility as replacements for iron-chromium and iron-chromium-nickel alloys.
(Q23n, 2-12; SGA-h, Fe, *Al, Mo*)

163-Q. Forgeability. Albert Portevin. *Metal Progress,* v. 70, Dec. 1956, p. 120-123.

Comments on forgeability and metal forming. (Q23q)

164-Q. Deformation Twinning in Materials of the A4 (Diamond) Crystal Structure. A. T. Churchman. *Proceedings of the Royal Society, Series A.,* v. 238, no. 1213, Dec. 18, 1956, p. 194-203.

Deformation twins have been observed on (111) and (123) planes in silicon, germanium, indium antimonide and gallium antimonide. 13 ref. (Q24b; Si, Ge, In, Ga)

165-Q. A Three-Dimensional Photoelastic Study of Contact Stresses in the Head of a Model of a Railroad Rail. M. M. Frocht. *Proceedings of the Society for Experimental Stress Analysis,* v. XIV. No. 1. p. 1-12.

Using the shear difference and the stress-freezing processes, principal stresses and maximum shears were determined in the transverse section of the rail under the center of the wheel. (Q28k; 4-7)

166-Q. Modified Theories of Fatigue Failure Under Combined Stress. W. N. Findley and P. N. Mathur. *Proceedings of the Society for Experimental Stress Analysis,* v. XIV. No. 1. p. 35-46.

Several proposed theories were modified to account for anisotropy and state of stress, and were examined in the light of existing data. (Q23g, 3-16, 3-21; 10-1)

167-Q. Stress Concentration Factors for Circular Fillets in Stepped Wall Cylinders Subject to Axial Tension. L. H. N. Lee and C. S. Ades. *Proceedings of the Society for Experimental Stress Analysis,* v. XIV. No. 1. p. 99-108.

Plastic cylinders were cast, cured, machined, stressed and sliced and slices were studied photoelastically. Hysol 6020 epoxide resin was found to be very promising. (Q25k; NM-d)

168-Q. The Study of the Propagation of Stress Waves by Photoelasticity. J. C. Feder, R. A. Gibbons, J. T. Gilbert and E. L. Offenbacher. *Proceedings of the Society for Experimental Stress Analysis,* v. XIV. No. 1. p. 109-122.

Wave propagation was followed with a high-speed framing camera

and initiation of the stress waves by ballistic methods which produce high rates of loading. (Q21f)

169-Q. Mechanism of Fatigue. W. A. Wood. Paper from "Fatigue in Aircraft Structures". Academic Press, p. 1-19.

Observations of fatigue deformation were interpreted as proceeding from fine slip as opposed to coarse slip and that pure fatigue may impose considerable plastic strain without progressive strain hardening. Tests on copper in alternating torsion showed that a total of nonhardening plastic strain could be imposed in fatigue that would be impractical in static deformation. 18 ref. (Q23f)

170-Q. The Mechanism of Fatigue in Aluminum and Aluminum Alloys. P. J. E. Forsyth. Paper from "Fatigue in Aircraft Structures". Academic Press, p. 20-42.

Fatigue behavior was examined in superpurity aluminum, Al 4% copper alloy, Al 10% Zn and Al 7.5% Zn 2.5% Mg alloys. Recrystallization and aging was produced under fatigue stresses at nominally room temperature and occurred mainly in localized regions. 25 ref. (Q23f, N5f, N7a; Al)

171-Q. Experiments Relating to the Origin of Fatigue Cracks. N. Thompson. Paper from "Fatigue in Aircraft Structures". Academic Press, p. 43-61.

Summary of results of investigations of copper and of aluminum on the basic mechanism of fatigue. Similarities in crack formation and crack propagation in the two metals. 8 ref. (Q7, Q26q)

172-Q. On the Effects Preceding Fatigue Failure of High-Strength Aluminum Alloys. R. F. Hanstock. Paper from "Fatigue in Aircraft Structures". Academic Press, p. 62-82.

Resonance method of testing was employed. Variation of hysteresis with stress, critical stress and comparison of the effects of temperature and cyclic stress are discussed. 6 ref. (Q7; Al)

173-Q. Performance of Steel Under Repeated Loading. M. Hempel. Paper from "Fatigue in Aircraft Structures". Academic Press, p. 83-103.

Results of investigations of deformation phenomena under cyclic stressing, fatigue strength of heat resisting steels at elevated temperatures in the range of 500-650° C., and effect of surface finish on the fatigue strength. 31 ref. (Q23f, 2-12; SS, SGA-h)

174-Q. Fatigue Cracks as Stress Raisers and Their Response to Cyclic Loading. C. E. Phillips. Paper from "Fatigue in Aircraft Structures". Academic Press, p. 104-125.

Observations of crack growth of unnotched and V-notched specimens of a mild steel, a heat treated nickel-chromium steel, and a 4% copper-aluminum alloy. 13 ref. (Q26q; CN, AY, Al)

175-Q. Scatter of Fatigue Life and Fatigue Strength in Aircraft Structural Materials and Parts. W. Weibull. Paper from "Fatigue in Aircraft Structures". Academic Press, p. 126-145.

Fatigue properties are described by S-N curves. Procedure for converting life distribution into strength distribution is discussed. 7 ref. (Q23f, Q7g, T24a)

176-Q. Accumulation of Fatigue Damage. A. M. Freudenthal and R. A. Heller. Paper from "Fatigue in Aircraft Structures". Academic Press, p. 146-177.

Tape-programmed, random-load, rotating-beam fatigue testing machine is described. Results are correlated from random testing machines with constant amplitude testing machines. Results of random fatigue tests on 2024 and 7075 aluminum alloys are tabulated. 14 ref. (Q7c, X29; Al)

177-Q. Performance Fatigue Testing With Respect to Aircraft Design. E. Gassner. Paper from "Fatigue in Aircraft Structures". Academic Press, p. 178-206.

Survey of fatigue testing in the German Aeronautical Research Institute, 1938-1945, and in the Laboratory for Performance Testing since the war, including wing load distributions, and service performance tests. 8 ref. (Q7g, T24a)

178-Q. Structural Fatigue Research and Its Relation to Design. P. D. Brooks. Paper from "Fatigue in Aircraft Structures". Academic Press, p. 207-232.

Sequential steps in handling major fatigue requirements on complete design projects as applied to two typical aircraft, namely, medium-range transport, and long-range interceptor. 11 ref. (Q23g, 17-1, T24a)

179-Q. The Elements of a Helicopter Fatigue Substantiation Program. H. T. Jensen. Paper from "Fatigue in Aircraft Structures". Academic Press, p. 233-254.

Basic facilities used in the test program are strain-gage flight test aircraft, tie down test aircraft, fatigue laboratory and the rotor-whirl stand. 4 ref. (Q7g, T24a)

180-Q. The Relationship Between Load Spectra and Fatigue Life. Bo Lundberg and Sigge Eggwertz. Paper from "Fatigue in Aircraft Structures". Academic Press, p. 255-278.

Applications of the linear cumulative damage theory in conjunction with the straightline load spectrum and the adopted S-N relation in evaluation of conventional fatigue results can also be used in the evaluation of program test results. 24 ref. (Q7)

181-Q. Fatigue Testing in Relation to Transport Aircraft. R. J. Atkinson. Paper from "Fatigue in Aircraft Structures". Academic Press, p. 279-294.

Examples of fatigue data on which design might be based, fatigue loading actions, and a scheme of testing geared to design and early production stages are discussed. 9 ref. (Q7g, T24a)

182-Q. Fatigue Engineering in Aircraft. Paul Kuhn. Paper from "Fatigue in Aircraft Structures". Academic Press, p. 295-316.

A review of design problems involving fatigue under constant-amplitude loading and under variable-amplitude loading. 26 ref. (Q7d, Q7e, T24a)

183-Q. Some Remarks on the French Approach to the Problem of Fatigue. J. Cornillon. Paper from "Fatigue in Aircraft Structures". Academic Press, p. 317-322.

General outline of methods employed including evaluation by cumulative damage theory and fatigue tests. 9 ref. (Q7)

184-Q. Aspects of Fatigue Design of Aircraft Structures. F. Turner. Paper from "Fatigue in Aircraft Structures". Academic Press, p. 323-346.

Statistical approach is emphasized in design problems relative to fatigue and static failure. 17 ref. (Q7q, T24a)

185-Q. The Extent of the Fatigue Problem in Aircraft Design. H. Giddings. Paper from "Fatigue in Aircraft Structures". Academic Press, p. 347-375.

Review of types of fatigue loading actions, strength and design of aircraft components, and effect of operating, inspection and maintenance procedures on fatigue life. (Q23f, T24a, 17-1)

186-Q. Practical Aspects of Fatigue in Aircraft Structures. R. L. Schliecher. Paper from "Fatigue in Aircraft Structures". Academic Press, p. 376-426.

Unit and component fatigue tests, case histories, and an outline of good design practices. 12 ref. (Q7, T24a, 17-1)

187-Q. Aircraft Structural Fatigue Research in Australia. W. W. Johnstone and A. O. Payne. Paper from "Fatigue in Aircraft Structures". Academic Press, p. 427-448.

Review of fatigue research by the Structures Division of the Aeronautical Research Laboratories and summary of present status. 47 ref. (Q23f, T24a)

188-Q. (English.) **Improvement of Copper Alloy Spring. Pt. I. Effect of Various Third Elements Added to Plain 60/40 Brass.** Masayuki Kawasaki and Osamu Izumi. *Science Reports of the Research Institutes, Tohoku University,* v. 8, Dec. 1956, p. 484-492.

Iron, aluminum, manganese, nickel, cadmium and tin were added, and the alloys of copper-manganese-nickel and copper-iron series were also examined.
(Q general, 2-10; Cu, SGA-b)

189-Q. (English.) **Improvement of Copper Alloy Springs. Pt. II. 60/40 Brass Series Containing Iron, Manganese and Tin.** Osamu Izumi and Masayuki Kawasaki. *Science Reports of the Research Institutes, Tohoku University,* v. 8, Dec. 1956, p. 493-501.

Manganese and tin proved to be the most favorable elements.
(Q general, 2-10; Cu, *Fe, Mn, Sn,* SGA-b)

190-Q. (Japanese.) **On the Hot Hardness of Heat Resistant Titanium-Base Alloy.** T. Araki and J. Isono. *Japan Institute of Metals. Journal,* v. 20, Oct. 1956, p. 547-550. (CMA)

Titanium-base alloys were tested for heat resistance at high vacuum and temperatures up to 700° C. by measuring hardness. Hot hardness is found to increase with the amount of aluminum. Great hardness oc-

curs in some alloys water-quenched from 900° C., due to tempering at 500° C.; such alloys contain at least 6% Al and 4% Mo and/or Cr. The latter go into the β phase during tempering. (Q23a, 2-12, 2-10; Ti)

191-Q. (Japanese.) **Improvement of Heat Resistance of Aluminum Alloys by Addition of Zirconium II.** Y. Mishima and N. Takahashi. *Light Metals,* v. 11, no. 21, 1956, p. 64-67. (CMA)

About 0.5% zirconium is effective in improving the heat resistance of aluminum alloy. Studies were conducted with six aluminum alloys, cold rolled to sheet, annealed and quenched. Tensile and hardness data are tabulated.
(Q general, 2-12; Al, *Zr*)

192-Q. (Japanese.) **Theory of Plastic Deformation and Maximum Shearing Stress of Aluminum.** Koiti Saito. *Nippon Kikai Gakai,* v. 22, no. 123, Nov. 1956, p. 821-827.

Theory of plasticity based on the maximum shearing stress in the triaxial deformations of metals is established, using the experimental results as to the work hardening properties by pure shearing. Comparison of experimental results. 7 ref. (Q24; Al)

193-Q. (Japanese.) **Effects of Section Size on Static Tensile Properties of Mild Steel Bars.** Tadasi Isibasi. *Nippon Kikai Gakai,* v. 22, no. 123, Nov. 1956, p. 827-832.

Stress and strain in a round bar were analyzed by using the distribution of the axial stress over the cross-section of the bar. Reasons for unevenness of stress distribution over the cross-sections of streched specimens. Fundamental calculation of stress beyond the yield point. (Q27k; CN)

194-Q. (Japanese.) **Effect of the Stepwise Change of Stress on Creep of Carbon Steel at High Temperature.** Toshio Mishihara, Kichinosuke Tanaka and Kiyotsugu Oj. *Nippon Kikai Gakai,* v. 22, no. 123, Nov. 1956, p. 832-838.

Creep behavior of 0.14% carbon steel at 450° C. Apparatus for experiments; results. 10 ref.
(Q23d, 1-3; CN)

195-Q. (Japanese.) **Researches on Titanium Fasteners—I. Photo-Elastic Determination of Stress Concentration Factors for the Unified Screw Thread.** I. Hiraki, S. Shimamura and Y. Kanae. *Tokyo. Government Mechanical Laboratory. Journal,* v. 10, Nov. 1956, p. 213-219.

The photo-elastic method was applied in the determination of stress concentration factors for the Unified Screw Thread of titanium fasteners. Four cases were considered: titanium bolt with titanium nut; titanium bolt with aluminum nut; load concentrated at a turn of the thread helix; and load distributed along the thread helix. The test used is considered more suitable than other tests. (Q25k, 1-4, T7; Ti)

196-Q. (Russian.) **Resistance to Deformation of Commercial Titanium.** L. N. Sokolov, V. I. Zaleskiy and V. P. Yelyutin. *Sb. Mosk, in-ta stali,* no. 33, 1955, p. 143-153. *Referativnyy Zhurnal Fizika,* no. 9, Sept. 1956, Abstract No. 25777.

The resistance to deformation of commercial titanium was determined by tensile methods (in the interval 20-800°) and deposition (at 400-800°). The speed of deformation during tension and deposition is 1.7 mm/per min. At room temperature commercial titanium has a strong resistance to deformation. At temperatures below 700° and small degrees of deformation (up to 10%) strengthening of titanium occurs. A considerable increase of deformation does not produce further strengthening. Over 700° titanium has a low resistance to deformation. The heating of commercial titanium over 1100° contributes to the diffusion of O_2 and N_2 into the metal and the formation of a brittle phase on the surface. (Q23; Ti)

197-Q. (Report.) **Investigation of the Compressive, Bearing and Shear Creep-Rupture Properties of Aircraft Structural Metals and Joints at Elevated Temperatures, Part 1.** F. J. Vawter and others, Cornell Aeronautical Laboratory, Inc. for Wright Air Development Center. 194 p. June 1956. U. S. Office of Technical Services, PB 121436. $2.50.

Equipment and special fixtures for conducting tensile, compression, bearing and shear creep tests. Data on 2024-T3 aluminum sheet, C-110M titanium sheet, type 321 stainless steel sheet, and rivet wires of 2117-T 4 aluminum, Monel, and type-301 stainless steel, 24S-Ts aluminum sheet and 24S-T3 aluminum plate. (Q3, X29; Al, Ti, SS, Ni)

198-Q. (Report.) **Investigation of Compressive - Creep Properties of Aluminum Columns at Elevated Tem-**

peratures, Pt. 4—Additional Studies. R. L. Carlson, E. G. Bodine and G. K. Manning, Battelle Memorial Institute for Wright Air Development Center. 80 p. April 1956. U. S. Office of Technical Services, PB 121465. $2.00.

Creep buckling of columns at elevated temperatures. Data for short inelastic columns of aluminum alloy, square tubing columns of aluminum alloy, and columns of stainless steel. (Q3c; Al, SS)

199-Q. (Book.) **Defects and Failures of Metals: Their Origin and Elimination.** E. P. Polushkin. 339 p. 1956. Elsevier Publishing Co., 445 Park Ave., N. Y. 22, N. Y., and D. Van Nostrand Co. Inc., 257 Fourth Ave., New York 10, N. Y. $12.50.

Deals with segregation, blowholes, pipe, decarbonization, scaling, residual stresses, embrittlement, fatigue, flakes, cracks, wear, corrosion and other defects. References follow each chapter. (Q general, R general, 9)

200-Q. (Book.) **International Conference on Fatigue of Metals.** v. I-III. Papers individually paged. 1956. The Institution of Mechanical Engineers, 1 Birdcage Walk, London, S. W. 1, England.

Numerous papers dealing with stress distribution; effects of temperature, frequency, and environment; metallurgical aspects of fatigue; basic mechanisms; and engineering and industrial significance of fatigue. Pertinent papers are abstracted individually. (Q23g, Q7)

201-Q. (Book.) **Relaxation Properties of Steels and Super-Strength Alloys at Elevated Temperatures.** 104 p., 1956. American Society for Testing Materials, 1916 Race St., Philadelphia 3, Pa. (Special Technical Publication No. 187) $4.00.

Summary of data on relaxation strengths for low-alloyed Mo, Cr, and V-bearing steels, 12% Cr-type steels, a number of super-strength alloys and cast iron.
(Q23d, 2-12; AY, SS, CI)

202-Q. (Book.) **Fatigue in Aircraft Structures—Proceedings of the International Conference held at Columbia University, Jan. 30, 31 and Feb. 1, 1956.** Edited by Alfred M. Freudenthal, 456 p. 1956. Academic Press, 111 Fifth Ave., New York 3, N. Y. $12.00.

Papers on the general problem of fatigue in metals, fatigue in steel and aluminum, and fatigue in metal aircraft parts. Papers separately abstracted. (Q23f, Q7, T24a)

203-Q. (Book—Russian.) **Mechanical Properties of Isothermally Hardened Steel.** A. S. Meyseyenke, 141 p. 1956. Mashgis, Kiev-Moscow, U.S.S.R.

Investigation of the mechanical properties of medium carbon, high carbon and alloy toolsteels subjected to isothermal hardening to martensite. The effects of hardening temperature and soaking time, isothermal soaking in the quench bath, low-temperature tempering, and the cold treatment of hardened steel upon mechanical properties have been demonstrated. The mechanical properties of steels subjected to ordinary hardening are cited for purposes of comparison. 89 ref. (Q general, J general; TS)

204-Q. (Book—Russian.) **Steels and Alloys for Service at High Temperatures.** M. L. Bernshteyn, 239 p. 1956, Metallurgizdat, Moscow, U.S.S.R.

Theory of heat resistance; data on the properties and treatment of heat resistant ferrite, pearlitic and austenitic steels and heat resistant nickel, cobalt, chromium, titanium and molybdenum-based alloys. Results of the study of the structure of heat resistant steels and alloys. 194 ref.
(Q general, 2-12; SGA-h, SS, Ni, Co, Cr, Ti, Mo)

205-Q. Testing Station for Tall Structures. *British Steelmaker,* v. 23, Jan. 1957, p. 16-17.

Design of suitable testing station for load measurements of steel structures. (Q10, T26; ST)

206-Q. Hydrogen Embrittlement of Steel and Its Relation to Weld Metal Cracking. H. G. Vaughan and M. E. de Morton. *British Welding Journal,* v. 4, Jan. 1957, p. 40-61.

Theories of hydrogen embrittlement of steel are discussed and the initiation of cleavage cracks related to the effects of hydrogen on the mechanical properties of steel. 35 ref. (Q26s; ST, 7-1)

207-Q. Flow and Fracture Characteristics of Binary Wrought Magnesium-Lithium Alloys. M. W. Toaz and E. J. Ripling. *Institute of Metals, Journal,* v. 85, Dec. 1956, p. 137-144.

Tensile properties of hexagonal, mixed hexagonal and cubic structures as functions of testing tem-

perature and strain rate. 14 ref. (Q27a, 2-11, 3-17; Mg, *Li*)

208-Q. Effects of Cyclic Stress and Frequency on Deformation Markings in Fatigued Copper. D. S. Kemsley. *Institute of Metals, Journal,* v. 85, Dec. 1956, p. 153-157.

Metallographic examination and results. (Q24c, Q7a, M27; Cu)

209-Q. A New Look at Temper Brittleness. G. K. Bhat. *Iron Age,* v. 179, Jan. 24, 1957, p. 73-77.

Discusses valid method of determination, effects on other mechanical properties, the two modes of embrittlement, sensitivity of tempered martensite, effects of alloying elements on susceptibility to embrittlement and significance of phase at grain boundaries. (Q26s)

210-Q. How to Cut Down on Weld Metal Cracking. *Iron Age,* v. 179, Jan. 24, 1957, p. 83.

Hot cracking promoted by presence of phosphorus, nickel and carbon and reduced by manganese. (Q26, 2-12, 2-10; ST, 1-7)

211-Q. Mechanical Properties of Flake Graphite Cast Irons. G. N. J. Gilbert, A. M. I. Mech. *Iron and Steel,* v. 30, Jan. 1957, p. 19-24.

Review of literature referring to variation of tensile strength with degree of eutectic and relationship between diameter of test bar and tensile strength. To be continued. 19 ref. (Q27a, 1-10; CI)

212-Q. Upper Nose Temper Embrittlement of a Ni-Cr Steel. L. D. Jaffe and D. C. Buffum. *Journal of Metals,* v. 9, Jan. 1957, p. 8-16.

Temper embrittlement of a nickel-chromium steel was investigated both isothermally and with temperature changes. Embrittlement was most rapid in two temperature ranges: 490° to 550° C. and just below the Ae_1, near 675° C. Grain boundary attack and grain growth are discussed. 29 ref. (Q23e, N8a, N3; AY, *Ni, Cr*)

213-Q. On the Nature of Embrittlement Occurring While Tempering a Ni-Cr Alloy Steel. G. Bhat and J. F. Libsch. *Journal of Metals,* v. 9, Jan. 1957, p. 20-22.

A study of the characteristics of the embrittlement in a nickel-below the Ae_1, near 675° F. and at 1250° F. It is suggested that retrogression phenomena are not necessary to explain embrittlement; segregation of solute atoms to prior austenite and ferrite grain boundaries may provide a better explanation. 7 ref. (Q26s, N8a; AY, *Ni, Cr*)

214-Q. Embrittlement of Ti-Al in the 6 to 10 Pct. Al Range. F. A. Crossley and W. F. Carew. *Journal of Metals,* v. 9, Jan. 1957, p. 43-46. (CMA)

A second embrittling phase occurs in titanium with 6-10% Al addition; it is in the form of a precipitate arising at temperatures below 800° C. The degree of embrittlement depends on the aluminum content, aging temperature and time, deformation rate and testing temperature. Data on tensile properties are presented in graphs and tables. 5 ref. (Q26s, Q27a, N7a; Ti, *Al*)

215-Q. Elastic Coefficients of Single Crystals of Alpha Brass. W. R. Hibbard, Jr. *Journal of Metals,* v. 9, Jan. 1957, p. 46.

Re-evaluation and new values for elastic coefficients. 4 ref. (Q21e; Cu-n, 14-11)

216-Q. Creep of Single Crystals and Polycrystals of Aluminum, Lead, and Tin. D. D. Wiseman, O. D. Sherby, and J. E. Dorn. *Journal of Metals,* v. 9, Jan. 1957, p. 57-59.

The activation energies for high-temperature creep of single crystals and polycrystalline specimens of high-purity aluminum, lead and tin were determined by the technique involving the effect of abrupt changes in temperature on the creep rates. 13 ref. (Q3n; 2-11; Al, Pb, Sn)

217-Q. Etch Pit and Slip Bands in Silicon. F. D. Rosi. *Journal of Metals,* v. 9, Jan. 1957, p. 76, 77.

Etch pit technique in the study of deformation markings. 2 ref. (Q24c, 1-4; Si)

218-Q. Grain-Boundary Displacement vs. Grain Deformation as the Rate-Determining Factor in Creep. J. A. Martin, M. Herman and N. Brown. *Journal of Metals,* v. 9, Jan. 1957, p. 78-81.

The height of the vertical grain-boundary displacements was measured on creep specimens of β-brass. The displacements followed a normal distribution whose standard deviation was a function of strain and was independent of temperature from 450° to 501° C. The strength of the grain, not the shear resistance of the boundary, was found to

be the rate-controlling factor in the creep of β-brass. 10 ref.
(Q3n; Cu-n)

219-Q. Hydrogen Embrittlement in an Ultra-High-Strength 4340 Steel. E. P. Klier, B. B. Muvdi and G. Sachs. *Journal of Metals,* v. 9, Jan. 1957, p. 106-112.

Embrittlement promoted by copper plating was compared to that developed by cathodic treatment in caustic soda. Tension, notch-tension, bend, and sustained-load tests were employed. Embrittlement was found to depend on strain rates used; however, recovery rate differed for the cleaned and plated specimens. 7 ref. (Q26s, Q27; AY)

220-Q. Tensile Deformation of Silver as a Function of Temperature, Strain Rate, and Grain Size. R. P. Carreker, Jr. *Journal of Metals,* v. 9, Jan. 1957, p. 112-115.

True stress, true strain data are reported for high purity (0.9997+) silver of three grain sizes over the temperature range 20° to 1173° K. Strain rate sensitivity was determined by rate-change tests. 3 ref. (Q24, 2-9, 2-11, 3-17; Ag)

221-Q. Effect of Orientation on the Plastic Deformation of Aluminum Single Crystals and Bicrystals. R. S. Davis, R. L. Fleischer, J. D. Livingston and Bruce Chalmers. *Journal of Metals,* v. 9, Jan. 1957, p. 136-140.

Tensile stress-strain curves reported. Iso-axial bicrystal specimens were used with one crystal rotated 45° about the stress axis with respect to the other. The 45° grain boundary did not raise the stress-strain curve of the bicrystal above that of the corresponding single crystal if two or more slip planes were initially equally favored. 11 ref. (Q24, 3-22; Al, 14-11)

222-Q. Embrittling Effect of Molybdenum on Electrodeposited Copper. H. R. Skewes. *Journal of Metals,* v. 9, Jan. 1957, p. 192. (CMA)

Molybdenum has not been recognized as an element which embrittles copper, and is usually co-precipitated with iron when the leachate from calcined chalcopyrite is treated. In the case of copper obtained from Chuquicamata, Chile, the electrolyte solutions gave brittle electrodeposits when the molybdenum content of the solutions was 10-25 mg per liter. Molybdenum was evidently not co-precipitated with iron, and a reduction to a lower valence state seems likely. (Q26s, N12d; Cu, *Mo*)

223-Q. Investigation of the Behaviour of Metals Under Deformation at High Temperatures. Part III. The Deformation, Microstructure, and Form of Carbides in a 0.15% C, 0.5% Mo Steel in Creep Tests. C. H. M. Jenkins and E. A. Jenkinson. *Journal of the Iron and Steel Institute,* v. 185, Jan. 1957, p. 23-46.

Vacuum tests at 450-850° C. from a few minutes to 13,470 hr. were made to trace extent of transcrystalline and intercrystalline cracking. Relationship of cavities to further deformation and cracking is discussed. Carbides identified by X-ray method. 22 ref. (Q3, M26r; AY)

224-Q. Observations on the Mechanical Behaviour of Heat-Treated Steel at High Hardness Levels. N. H. Polakowski. *Journal of the Iron and Steel Institute,* v. 185, Jan. 1957, p. 67-74.

Hypothesis for the high hardness of martensite and changes taking place in mechanical properties of quench-hardened steel upon temporary or plastic deformation. 45 ref. (Q24, Q29n; ST, 14-19)

225-Q. Influence of Residual Stress on Hardness. P. A. Blain. *Metal Progress,* v. 71, Jan. 1957, p. 99-100.

True hardness is a measure of resistance to impingement rather than the resistance to penetration now determined in "hardness" testing. (Q29, 3-16)

226-Q. The Effect of Surface Finish on Fatigue. B. Cina. *Metallurgia,* v. 55, Jan. 1957, p. 11-19.

Truer values of fatigue strength were obtained from electropolished steel alloys (mainly stainless variety) test pieces than from mechanically polished pieces. Stress-relieving after mechanical polishing gave similar results to electropolishing. 12 ref. (Q7a, L13p; SS)

227-Q. Proposed Program to Provide Design Data for Zirconium for Use in a Zirconium-Graphite-Sodium Reactor System. F. E. Bowman. *U. S. Atomic Energy Commission. NAA-SR-MEMO*-758, Aug. 7, 1953, 13 p. (CMA)

A testing program is proposed for mechanical properties of zirconium to be used in reactors and for zirconium resistance in a sodium milieu. The tests proposed cover tensile and shear strengths and corrosion of zirconium in static and dynamic sodium.
(Q27a, Q2g, R6m, W11; Zr)

228-Q. Creep Rupture of Zirconium Binary Alloys. J. H. Keeler. *U. S. Atomic Energy Commission SO-2525*, Nov. 1956, 24 p. (CMA)

A qualitative similarity exists between the creep and rupture behavior of zirconium and that of its alloys. Alloying increases the stress level necessary for creep and rupture; additions studied included iron, chromium, molybdenum, aluminum, columbium, and tantalum. At 25 and 300° C., low-temperature creep behavior was observed. Creep deformation became significant at 500° C. at low stresses.
(Q3m, Q3n, 2-10; Zr)

229-Q. Zircaloy-2 Hot Bend Tests Performed by the Youngstown Welding and Engineering Co. W. L. Frankhouser. *U. S. Atomic Energy Commission. WAPD-FE-954*, Aug. 10, 1955, 27 p. (CMA)

Zircaloy-2 strips were bent to angular shapes by hot forming; heating was in the 720°-865° F. range but dies were cold, except in one case in which the strips were heated to 620° F. Heating the work entirely by dies is impractical.
(Q6, 2-16; Zr)

230-Q. Tensile Properties of Hafnium-Zircaloy-2 Welds. H. R. Hoge. *U. S. Atomic Energy Commission. WAPD-MDM-5*, April 14, 1954, 13 p. (CMA)

Tensile data from tests of hafnium-Zircaloy-2 welds heated to various temperatures show that the welds are as strong as the component parts at 68° F., and are stronger at higher temperatures. The underbead porosity does not adversely affect the tensile strength.
(Q27a; Hf, Zr, 7-1)

231-Q. Brittle Fracture Propagation in Wide Steel Plates. W. J. Hall, R. J. Mosborg and V. J. McDonald. *Welding Journal*, v. 36, Jan. 1957, p. 1s-8s.

Plates were tested under various conditions of stress and temperature with a brittle fracture initiated at an edge notch by a wedge subjected to impact. Strain response, crack speed and fracture appearance noted. 3 ref. (Q26q; ST, 4-3)

232-Q. Brittle Fracture Initiation Tests. C. Mylonas, D. C. Drucker and L. Isberg. *Welding Journal*, v. 36, Jan. 1957, p. 9s-17s.

Welded and unwelded notched steel plates with various prestrains were pulled at various temperatures. Transversely prestrained plates with punched notches fractured consistently below yield under static loading. Fractures were as brittle as those found in service in the region of propagation and at point of initiation. 46 ref. (Q26q; ST, 4-3)

233-Q. Behavior of Welded Built-Up Beams Under Repeated Loads. J. E. Stallmeyer, W. H. Munse and B. J. Goodal. *Welding Journal*, v. 36, Jan. 1957, p. 27s-36s.

Small A373 steel beams manually welded using E7016 electrodes and a back-stepping welding procedure, and field splice configurations were fatigue tested in comparison with A373 steel as-received. Presence of splice materially reduces fatigue strength of a welded beam. 6 ref. (Q7a; ST, 7-1)

234-Q. Notch Slow-Bend Testing of Zircaloy-2. R. G. Wheeler. *Welding Journal*, v. 36, Jan. 1957, p. 37s-40s. (CMA)

The effects of notch geometry and the shape of the test piece on the results of slow-bend tests on Zircaloy-2 are evaluated. The testing apparatus is described. Cold work changes the properties of Zircaloy-2 at 25° C., but the change is more noticeable at 350° C. where the fracture angle of the most highly worked material is 400% greater than it is in annealed alloy. The initial change in bend properties with cold work is large. (Q5j; Zr)

235-Q. Properties of Austenitic Chromium-Manganese Stainless-Steel Weld Metal. W. T. DeLong and H. F. Reid, Jr. *Welding Journal*, v. 36, Jan. 1957, p. 41s-48s.

Comparison of chromium-manganese stainless-steel weld metal ties with conventional chromium-nickel weld deposits. The Cr-Mn alloys combine very high strength with reasonable ductility, and high crack resistance in a restrained joint with a completely nonmagnetic structure. 4 ref. (Q27a, Q23p; SS, 7-1)

236-Q. The Significance of the Tensile Test to Pressure Vessel Design. W. E. Cooper. *Welding Journal*, v. 36, Jan. 1957, p. 49s-54s.

Discussion of yield pressure, maximum pressure, strain at maximum pressure and localization of deformation at rupture in terms of initial dimensions of thin-walled cylindrical and spherical shells and the material properties of vessels made of ductile materials. It is not possible to relate the maximum pressure which a vessel can with-

stand directly to the ultimate tensile strength of the material from which it is constructed. 12 ref. (Q27, 3-24, T26)

237-Q. The Formation and Reduction of Internal Stresses Due to Plastic Deformation. Hans Buhler. *Wire,* Dec. 1956, p. 28-33.

The estimation of internal stresses, effects obtained under conditions of a uniformly stressed and nonuniformly stressed cross-section. 23 ref. (Q25g)

238-Q. (German.) **Investigations of Anelastic Effect in Iron-Chromium Alloys.** Karl Bungardt and Hans Preisendanz. *Archiv für das Eisenhüttenwesen,* v. 27, Nov. 1956, p. 715-724.

Measurements of anelastic effect (grain-boundary damping) of iron-chromium alloys up to 45% Cr. A vacuum apparatus according to Ké was used. Nitrogen and carbon influence the origin of three separate anelastic effect maxima at 220, 600 and 720° C. but there is still no explanation for this influence. 25 ref. (Q22, 1-2; Fe, *Cr*)

239-Q. (German.) **Testing of Unalloyed Steels in a Multiaxial State of Stress by Internal Pressure.** Alfred Krisch. *Archiv für das Eisenhüttenwesen,* v. 27, Dec. 1956, p. 767-775.

Samples of five Thomas and Siemens-Martin steels with 0.04 to 0.2% C were tested for multiaxial stress by a combination of longitudinal stress and internal hydraulic pressure. These samples were drilled hollow, unalloyed, stress unrelaxed and relaxed and partly also age proof. It is shown that yield strength and tensile strength are not altered essentially by the multiaxiality of stress for either the normalized or the artifically aged steels. 13 ref. (Q25g, Q27a; CN)

240-Q. (German.) **Investigation of the 475° Embrittlement of Iron-Chromium Alloys.** Karl Bungardt and Wolfgang Spyra. *Archiv für das Eisenhüttenwesen,* v. 27, Dec. 1956, p. 777-786.

Eight iron-chromium alloys containing from 18 to 45% Cr. were investigated as to changes of hardness, electrical resistivity, dilatation, thermo-electric stress and magnetizability with temperature. The speed of change of the phyiscal properties is largest immediately after the initial heating. After annealing for a longer time the values approach a limit asymptotically. 17 ref. (Q26s, Q29n, P15q, P16, 2-11; SS)

241-Q. (German.) **Considerations Concerning the Change of State Leading to the 475° Embrittlement of Iron-Chromium Alloys.** Werner Köster and Albrecht von Kienlin. *Archiv für das Eisenhüttenwesen,* v. 27, no. 12, Dec. 1956, p. 793-799.

The change of state which leads to the 475° embrittlement of iron-chromium alloys is explained by a segregation into iron-rich and chromium-rich zones. The area of the 475° embrittlement has the form of a two-phase region in the solid state. 28 ref. (Q26s, N12p; Fe, *Cr*)

242-Q. (German.) **The Damping of Mechanical Oscillations During the Martensite Reaction.** Erich Scheil and Johannes Müller. *Archiv für das Eisenhüttenwesen,* v. 27, Dec. 1956, p. 801-805.

The beginning of the γ-α-transformation of the irreversible iron-nickel alloys can be recognized much earlier on the damping curve of mechanical oscillations than on the curves of the elasticity modulus and the electrical resistivity. Formerly this was explained as a "preparation" of the transformation. The work points out that this preparation effect does not exist or is so small that it cannot be measured with the chosen apparatus. 15 ref. (Q7g, N8p; Fe, *Ni*)

243-Q. (Japanese.) **Degree of Fatigue in Metals.** Toshio Nishikara, Toshimori Kore and Ryuiti Masuo. *Nippon Kikai Gakai,* v. 22, Nov. 1956, p. 839-844.

Fatigue is assumed to be caused by crystal distortion; new relation between the repeating stress and the number of stress repetitions observed. (Q7)

244-Q. (Japanese.) **On the Fatigue Strength of Brass and Duralumin.** Yosio Ohasi and Shokei Murayama. *Nippon Kikai Gakai,* v. 22, Nov. 1956, p. 845-850.

The effect of surface rolling on the fatigue strength with grooved specimens made of brass and duralumin. The bottoms of grooves were rolled with varying pressures by a roller which has a thickness half the width of grooves. 4 ref. (Q7a, 3-18, Cu-n, Al)

245-Q. (Japanese.) **An Experiment on Fatigue of Low-Carbon Steel at High Temperature.** Zenji Ando, Yozo Kato and Hicoshiro Watari. *Nippon Kikai Gakai,* v. 22, Nov. 1956, p. 851-855.

Experimental results of the fatigue test under rotating bending stress

at high temperatures using unnotched and notched specimens with a circumferential groove on a semicircle of low-carbon steel (0.12% C). The conditions of the fatigue test were: Temperature; advancing by 100° C. from room temperature to 600° C. speed of stress reversals, 1700 rpm. 4 ref. (Q7a, Q7c; CN-g)

246-Q. (Japanese.) **Effect of Mechanical Treatment of Metal Surfaces on Fatigue.** Shigekatsu Karvata. *Nippon Kikai Gakai,* v. 22, Nov. 1956, p. 856-858.

Effect of shot peening a fillet of a stepped shaft on the torsional bending fatigue strength. 25 ref. (Q7a, 3-16)

247-Q. (Japanese.) **The Influence of Surface Roughness on the Mechanism of Contact Between Metal Surfaces.** Genginosuke Yoshimoto, Tadatsu Tsukizoe and Susumu Kikuchi. *Nippon Kikai Gakai,* v. 22, Nov. 1956, p. 859-862.

Theoretical deductions are discussed in the light of experimental evidence; the deduced relationships between the applied load and the distance through which the one surface cuts into the other surface are compared with the results of experiments. (Q9p)

248-Q. (Russian.) **Investigation of the Recrystallization of Titanium and Its Alloys. III. Effect of Annealing Temperature on Mechanical Properties and Microstructure of Titanium.** E. M. Savitski and M. A. Tylkina. *Akademiya Nauk S.S.S.R. Investiya, Otdelenie Tekhnicheskikh Nauk,* no. 10, Oct. 1956, p. 125-127. (CMA)

It is found that, whatever the metallurgical origin of a sample of commercial titanium, its mechanical properties are impaired by the presence of some grams of the β modification, which remain after heating above 1000° C. and subsequent cooling that results in the transformation of the main mass into the α-phase. In order to utilize the favorable plastic properties of a pure α-phase, and to obtain a final product in the same phase, it is recommended to resort to a step-like hot deformation, alternating with annealing and ending in a last step performed after the pure α state has been reached. 1 ref. (Q23, N5, 2-14; Ti)

249-Q. Internal Friction and Diffusion in 31% Alpha Brass. J. Hino, C. Tomizuka and C. Werts. *Acta Metallurgia,* v. 5, Jan. 1957, p. 41-49.

Measurements and discussions on the relaxation time of the order peak and the radioactive tracer coefficients of both copper and zinc in single crystals. 21 ref. (Q22, N1c; Cu-n)

250-Q. Selection of Testing Locations in Aluminum Die Forgings. Ihor E. Suchoversky. *Aeronautical Engineering Review,* v. 16, Jan. 1957, p. 29-34.

Directionality of mechanical properties, basic method of testing forgings, property level testing. (Q general, 1-4; Al, 4-1)

251-Q. On the Mechanism of Fatigue. F. R. Shanley. *Aircraft Engineering,* v. 29, Jan. 1957, p. 11-12.

Discussion on the unbonding of atoms by the repeated application of stresses well below the nominal ultimate tensile strength. (Q7)

252-Q. Selection of Aluminum Alloys by Fatigue Properties. R. G. Ward. *Aircraft Engineering,* v. 29, Jan. 1957, p. 19-20.

A method of comparing the performance of different alloy types under fatigue conditions for which complete data are not available. 4 ref. (Q7; Al)

253-Q. Effect of Surface Finish on the Fatigue Strength of Titanium Alloys RC130B and Ti 140A. G. M. Sinclair, H. T. Corten and T. J. Dolan. *American Society of Mechanical Engineers, Transactions,* v. 79, Jan. 1956, p. 89-96. (CMA)

A study of the effect of surface finishing operations on the fatigue strength of RC130B and Ti 140A showed that the fatigue strength varied with the hardness of the surface layer; roughness has a lesser effect. Grinding gave the lowest surface hardness and cold rolling gave the highest. Microhardness was measured and notch properties were tested. The data are evaluated with an equation which is derived. A nomograph is shown. 9 ref. (Q7a, 3-20; Ti)

254-Q. Elastic Constants in Structural Design With Particular Applications to Titanium. S. A. Gordon. *Battelle Memorial Institute. Titanium Metallurgical Laboratory. Report* 56, October 1956, 184 p. (PB 121600). Abstracted in: *U.S. Government Research Reports,* v. 27, Feb. 15, 1957, p. 60. (CMA)

Studies are presented to show the effect of changes in elastic constants on the formulas wherein they are

used. Design curves for titanium are shown for columns, buckling, torsion in cylinders and crippling of open sections. An analysis is given for some typical beams and columns. (Q21, 17-1; Ti)

255-Q. The Influence of Understressing on the Fatigue Properties of Flake Graphite and Nodular Graphite Cast Irons. G. N. J. Gilbert and K. B. Palmer. *British Cast Iron Research Association, Journal of Research and Development,* v. 6, Dec. 1956, p. 410-421.

Fatigue results on irons previously understressed for 20 million cycles at a stress 0.5 ton per sq. in. below the virgin fatigue limit.
(Q7, 3-16; CI)

256-Q. The Impact Properties of Ferritic Nodular Irons in the Ductile and Brittle Condition, Using Standard and B.C.I.R.A. Impact Specimens. G. N. J. Gilbert. *British Cast Iron Research Association, Journal of Research and Development,* v. 6, Dec. 1956, p. 422-429.

Impact values with standard Charpy and Izod specimens compared with B.C.I.R.A. ½ x ¾-in. V-notched specimens for research purposes and the ⅜-in. square unnotched specimen.
(Q6n, Q6r, 1-10, CI-r)

257-Q. How Ductile Iron Made Its Place in Machine Design. *Canadian Machinery and Manufacturing News,* Dec. 1956, p. 637-638.

Toughness, castability, wear resistance and tensile and yield strength are properties of ductile iron important in design.
(Q general, 17-1; CI-r)

258-Q. Testing Iron Whiskers. *Chemical and Engineering News,* v. 35, Jan. 14, 1957, p. 22-24.

New Westinghouse method for determining tensile strength of iron whiskers. (Q27a; Fe, 14-11)

259-Q. Stress in Electrodeposits. R. Pinner. *Electroplating and Metal Finishing,* v. 10, Jan. 1957, p. 7-11.

Review of stress in nickel, chromium, zinc, with reference to stress-increasing and stress-relieving agents, temperature, pH and current density. Effects of stress on adhesion, cracking, corrosion, fatigue and magnetic properties of deposit. (Concluded.) 55 ref.
(Q25, L17c; *Ni, Cr, Zn*)

260-Q. Testing Indentation and Abrasive Hardness of Hard Materials. P. Grozinski. *Industrial Diamond Review,* v. 16, Dec. 1956, p. 228-233.

Double cone shapes, selection of double cone diamonds, comparison of the indentation shapes. (To be continued.) (Q29b, Q29c)

261-Q. Nickel-Free Austenitic Stainless Steel. *Materials and Methods,* v. 45, Jan. 1957, p. 104-105.

Properties of Tenelon, a chromium-manganese-nitrogen grade steel, as a replacement for 18-8 nickel-containing grades. (Q general; SS-e)

262-Q. The Effect of Some Mill Additions on the Abrasion Resistance of a Titania-Opacified Enamel. R. H. Ashby and B. K. Niklewski. *Metal Finishing Journal,* v. 3, Jan. 1957, p. 19-28, 38.

Test procedure and equipment for testing abrasion resistance; results and discussion. (Q9n, 1-2, 8-21)

263-Q. Insuring Toughness in Forged Gun Tubes. A. Hurlich and A. F. Jones. *Metal Progress,* v. 71, Feb. 1957, p. 65-70.

Composition of steel for large gun forgings is not specified. Heat treatments can be adjusted by the manufacturer to meet required ductility (reduction of area) and toughness (Charpy impact at −40° F.). Soundness is determined by macroetching.
(Q23, Q6, J general; ST, 4-1, 15-24)

264-Q. Molybdenum as an Alloy Addition for Titanium. Harold Margolin. *Metal Progress,* v. 71, Feb. 1957, p. 86-91.

A 7% Al, 3% Mo alloy has superior strength-weight properties at elevated temperatures. Molybdenum also has favorable influence on hardenability and oxidation resistance. It seems possible that, with its help, a useful age-hardenable alloy can be developed.
(Q general, 2-10; *Mo*)

265-Q. Molybdenum for High Strength at High Temperatures. R. R. Freeman and J. Z. Briggs. *Metalworking,* v. 13, Feb. 1957, p. 50-51. (CMA)

Report to a recent meeting of the American Rocket Society indicated that molybdenum alloys may be top contenders for structural use beyond 1600° F.
(Q27a; Mo, SGA-h, SGB-a)

266-Q. Research on Cumulative Damage in Fatigue of Riveted Aluminum Alloy Joints. J. Schijve and F. A. Jacobs. *National Aeronautical Research Institute, Amsterdam,* no. M. 1999, Jan. 1956, 53 p.

Two-step tests and interval tests on 24 S-T Alclad riveted lap joints. Available data on light alloy "cumulative damage in fatigue" reviewed and compared. (Q7; Al, 7-3)

267-Q. Calculation of the Elastic Shear Constants of Magnesium and Magnesium Alloys. John R. Reitz and Charles S. Smith. *Physical Review,* v. 104, Dec. 1, 1956, p. 1233-1259.

Equations for elastic strain energy for magnesium. Coulomb contributions, Fermi surface, zone contributions, overlap-hole contributions, temperatures effect of elastic shear. (Q21d; Mg)

268-Q. On the Relation Among Stress, Strain, and Strain Rate in Copper Wires Submitted to Longitudinal Impact. C. Riparbelli. *Proceedings of the Society for Experimental Stress Analysis,* v. 19, No. 1, p. 55-70.

Data from exploratory tests of tensile impact are used for the interpretation of the mechanism of plastic deformation caused by longitudinal impact.
(Q24, Q27b; Cu, 4-11)

269-Q. Fatigue Damage Measured by Deflections of Rotating Beam Specimens. R. G. Crum and E. D'Appolonia. *Proceedings of the Society for Experimental Stress Analysis,* v. 19, No. 1, p. 71-82.

Construction and use of apparatus for continuously recording the mid-span deflection and the energy dissipated during cyclic loading of rotating beam fatigue specimens tested at various speeds. (Q7c)

270-Q. A Fatigue Testing Machine for Reversed Bending and Steady Torque. H. H. Mabie and M. S. Gjesdahl. *Proceedings of the Society for Experimental Stress Analysis,* v. 19, No. 1, p. 83-88.

Machine design, tests on triangular and square shafts with rounded corners, and on round shafts with keyways. (Q7b)

271–Q. Some Metallurgical Aspects of Pontiac V-8 Engine Pearlitic Malleable Iron Crankshaft. K. E. Valentine. *Society of Automotive Engineers, Preprint,* Jan. 1957, 6 p.

Mechanical properties, machining experiences.
(Q general, G17, T21b; CI-s)

272-Q. Metallurgical Designing for Strength. C. Zener. *Tech Engineering News,* v. 38, Nov. 1956, p. 52-57.

Atomic structure and deformation of metals; design principles.
(Q24, M25, 17-1)

273-Q. Effect of Ceramic Coatings on Creep of Alloys. *Technical News Bulletin, U.S. National Bureau of Standards,* v. 41, Jan. 1957, p. 6-7.

Composition of high-temperature ceramic coating and its creep phenomena. (Q3m; 8-21)

274-Q. Results of Practical Trials on Aluminium Tin Bearings. N. Collari and L. Paglialunga. *Tin and its Uses,* Autumn 1956, no. 37, p. 5-7.

The amount of wear in tramcar bearings for three different tin-aluminum alloys is compared.
(Q9n, T7d; Al, Sn)

275-Q Stability of Commercial Alpha-Beta Titanium Alloys. D. A. Wruck. *U.S. Air Force, Wright Air Development Center, Technical Report 56-343,* Aug. 1956, 35 p. (PB 121655). Abstracted in *U.S. Government Research Reports,* v. 27, Jan. 18, 1957, p. 21. (CMA)

The influence on α-β titanium alloy stability of temperature, time-at-temperature, stress and hydrogen content was studied for Ti-140A, Ti-155A, C-130AM, C-110M, Ti-6Al-4V, RS-140X and 3Mn complex. Stability up to the highest temperatures is feasible if the hydrogen content is low. Embrittling mechanisms are considered. The loss of ductility in Ti-150A exposed to 800° F. for 200 hr. may be recovered by annealing at 1200° F. for 24 hr.
(Q23p. Q26s, 2-11; Ti)

276-Q. Investigation of the Compressive, Bearing and Shear Creep-Rupture Properties of Aircraft Structural Metals and Joints at Elevated Temperatures. F. J. Vawter, et al. *U.S. Air Force, Wright Air Development Center, Technical Report 54-270 part 2,* Sept. 1956, 95 p. (PB 121656). Abstracted in *U.S. Government Research Reports,* v. 27, Jan. 18, 1957, p. 19. (CMA)

Tensile creep and bearing creep data and results of sheer-pin deformation tests are presented for titanium alloys A-70 and C-110M, SAE 4130 steel and type 321 stainless steel and other materials.
(Q3m; Ti, AY, SS)

277-Q. Creep and Stress-Rupture Properties of Zirconium; Effect of Annealing Treatment. R. W. Guard and J. H. Keeler. *U.S. Atomic Energy Commission, SO-2524,* May 1956, 20 p. (CMA)

Zirconium creep studies up to 500° C. show that creep is insignificant below yield strength stresses and 300° C. Annealing treatments become effective only above 500° C. Metallographic studies show that twinning is prominent only below 300° C. and that polygonization and boundary deformation are important above 500° C., especially for α-annealed material. The superior creep resistance of the β-annealed material is related to irregular boundary structure and resistance to polygonization. (Q3m, 2-14; Zr)

278-Q. **Effect of Cold Work on the Mechanical Properties of Zircaloy-2.** F. Forscher. *U.S. Atomic Energy Commission, WAPD-111,* Dec. 18, 1954, 44 p. (CMA)

The influence of cold work was studied for the longitudinal and transverse directions of Zircaloy-2 at temperatures between −195 and 500° C. The normal increase of ductility is halted at about 150° C. and resumes at 350° C. More cold work enhances this trend. The ductility in the transverse direction decreases with temperature between 150 and 350° C. with 25% cold work. Beyond this amount, cold work decreases the ductility. (Q23p, 3-18; Zr)

279-Q. **The Problem of Brittle Fracture. Part II.** W. D. Biggs. *The Welder,* v. 25, no. 127, July-Sept. 1956, p. 48-55.

General discussion of transition temperature, notch bend, tear, notched tensile, and explosion tests; effects of grain size, composition, structure, prior strain and aging. 28 ref. (To be continued.) (Q26s, Q23r; 2-9, 2-10, 3-20)

280-Q. **Further Studies on Stainless-Steel Hot Cracking.** P. P. Puzak and H. Rischall. *Welding Journal,* v. 36, Feb. 1957, p. 57s-61s.

Test data provide additional evidence supporting the hypothesis that grain boundary lignation is responsible for base-metal hot cracking of stainless steels. Short-time high-temperature tensile tests, and nature of fusible segregate compositions. 8 ref. (Q26p, Q3; SS)

281-Q. **The Plastic Ductility of Austenitic Piping Containing Welded Joints at 1200° F.** R. W. Emerson and R. W. Jackson. *Welding Journal,* v. 36, Feb. 1957, p. 89s-104s.

Investigation includes methods of attack for solving the problem of the choice of material for main steam piping. High-temperature tests and metallurgical examination and mechanism of service failures. 10 ref. (Q23p, 2-12; ST, 4-10, 7-1)

282-Q. (Dutch.) **Practical Aspects of Brittle Fracture of Steel.** G. E. Tummers. *Metalen,* v. 11, Nov. 1956, p. 496-502.

A review of important factors, especially choice of materials, design of structures, conditions of application (temperature, loading rate) and testing methods. (Q26s, 1-4, 17-1; ST)

283-Q. (French.) **Considerations on the Modulus of Elasticity of Cast Irons and Their Elastic Behavior in General.** Paul le Rolland and Elisabeth Plénard. *Fonderie,* no. 130, Nov. 1956, p. 427-438.

Shows the significance of the modulus of elasticity as an index of the quality of cast iron and discusses the elasticity of solids in general and cast iron in particular. 15 ref. (Q21; CI)

284-Q. (French.) **Results of Tests on Cast Iron With Copper.** Pierre Detrez. *Fonderie,* no. 130, Nov. 1956, p. 456-463.

Analysis of the properties of cast iron containing varying amounts up to 3% of copper from the point of view of tensile strength, hardness, resilience and modulus of elasticity. (Q general, 2-10; CI, *Cu*)

285-Q. (French.) **Measurement of the Modulus of Elasticity of Cast Iron by Various Methods and Comparison of the Results.** Paul le Rolland and Elisabeth Plénard. *Fonderie,* no. 131, Dec. 1956, p. 477-495.

Investigation of the modulus of elasticity of cast iron by three methods—static, pendulum and dynamic. (Q21a, 1-4; CI)

286-Q. (French.) **Special Cast Irons in the Construction of Diesel Motors.** Jean Gonin and Gerard de Smet. *La Machine Moderne,* no. 574, Jan. 1957, p. 33-38.

Analysis of the chemical and mechanical properties of cast irons to determine the best composition for use in conditions involving high speeds, stress and temperature. (Q general, W11, 17-7; CI)

287-Q. (French.) **Fatigue in Metals Under the Influence of Combined Stresses.** Wm. N. Findley. *Revue de la Société Royale Belge des Ingénieurs et des Industries,* Dec. 1956, p. 451-465.

Review of available information on fatigue phenomena. Several theories of fracture under the effect of combined stresses examined and modified to take into account verified data; general formula suggested. Influence of average stresses (including very high compression), cold extrusion, other normal tensions, anisotropy. 12 ref. (Q7f, 3-16)

288-Q. (German.) **Timing for Forgings as a Function of Resistance and Reheating Time.** E. Pflaume. *Fertigungstechnik,* v. 6, Dec. 1956, p. 541-543.

The influence of the varying deformation resistance of alloyed and unalloyed steels in obtaining a standard by means of a flux. On the basis of heated compression tests numerical values are obtained which together with metallurgically accepted temperature tolerances show usable flux values for forgings.
(Q24, F22; CN, AY)

289-Q. (German.) **The Influence of Storage at Room Temperature and Annealing on the Hydrogen Content, on Tensile Strength, Especially Elongation and Reduction Area of Solidified Welds.** Jakob Colbus. *Zeitschrift für Schweisstechnik,* v. 47, Jan. 1957. p. 14-18.

Welds from different electrodes are tested for hydrogen content and tensile strength. The testing is done immediately after welding, after storage for 6 weeks and after annealing at 250° C. for 6 to 16 hr. The dependence of the tensile strength, elongation and reduction of area upon the hydrogen content is determined. 4 ref. (Conclusion.)
(Q27a, 2-14; ST, *H*, 7-1)

290-Q. (Japanese.) **Deformation Resistance of High-Temperature Steels at 800, 900 and 1000° C.** Shoji Terai. *Sumitomo Metals,* v. 8, Oct. 1956, p. 221-228.

Strain-time curves at various temperatures under the different stresses, and the determination of deformation resistance based on the assumption that transient creep would be faint at testing temperature. 7 ref.
(Q24, 2-12; ST, SGA-h)

291-Q. (Russian.) **Relationship of Composition, Temperature and Heat Stability. III. Quinternary System Alloys Nickel-Chromium-Tungsten-Aluminum-Titanium.** I. I. Kernilov and F. M. Titov. *Izvestiva Akademii Nauk SSSR. Otdeleniye Tekhnicheskikh Nauk,* no. 10, Oct. 1956, p. 117-122.

Studies the relationship of composition, structure and heat stability of alloys of quinternary system nickel-chromium-tungsten-aluminum-titanium alloys in the temperature range of 600-1250° C. All of the alloys had the same chromium, tungsten and aluminum content (20%, 6% and 4.5% respectively), while the titanium content varied with the nickel from 0 to 10.0%. Smelting was conducted in a high-frequency laboratory furnace.
(Q general, 2-12; Ni, *Ti, Cr, W, Al*)

292-Q. (Report.) **Effect of Ceramic Coatings on the Creep Rate of Metallic Single Crystal and Polycrystalline Specimens.** J. R. Cuthill and W .N. Harrison, National Bureau of Standards (Wright Air Development Center). 53 p. April 1956. U. S. Office of Technical Services, P.B. 121493. $1.50.

Significant improvements in the creep characteristics of 80-20 Ni-Cr alloys at 1975° is reported for National Bureau of Standards No. N-143 ceramic coatings.
(Q3n; Ni, SGA-h, 8-21)

293-Q. (Report.) **Study of the Possibility of Reinforcing High-Temperature Alloys by Addition of Refractory Powders.** J. D. Burney, P. R. Mallory and Co. Inc. (Wright Air Development Center). 42 p. May 1956. U.S. Office of Techinical Service, P.B. 121474. $1.25.

Greatly improved stress-rupture characteristics, compared to 80-20 Ni-Cr were indicated for alloy reinforced with 1% alumina and densified by a liquid phase sintering technique. (Q23m, H15; Ni, SGA-h)

294-Q. (Book.) **Alcoa Aluminum Handbook.** 175 p. 1956. Aluminum Co. of America, Pittsburgh 19, Pa.

Tables of mechanical properties and specifications for wrought alloys, sheet and plate, wire, rod and bar, extrusions, tube and pipe, electrical conduction, structural shapes, forgings and casting alloys.
(Q general, S22; Al)

295-Q. (Book.) **Bibliography of the Material Damping Field (With Abstracts and Punched Card Codings).** L. J. Demer. 100 p. June 1956. U.S. Office of Technical Services, P.B. 121437. Washington 25, D.C.

Consists of over 900 references in the field of damping of materials and structures. Entries are coded according to a classification based on the *ASM-SLA Metallurgical Literature Classification.* The classifica-

tion scheme and its indexes are described. (Q22, Q8, A14d; 11-15)

296-Q. (Book.) **Data on Creep and Heat Resisting Steels.** 88 p. Samuel Fox and Co., Ltd., Stockbridge Works, England.

Data sheets on heat treatment, mechanical properties, creep rupture tests and relaxation tests.
(Q3, J general; SS, SGA-h)

297-Q. (Book.) **Friction and Lubrication.** F. P. Bowden and D. Tabor. 150 p. 1957. John Wiley and Sons, Inc., 440 Fourth Ave., New York 16, N. Y. $2.25.

Modern work and views on the mechanism of friction and lubrication; fundamental concepts and theory. Written for engineers, physicists and metallurgists.
(Q9p, 18-23)

298-Q. (Book.) **Proceedings of the Society for Experimental Stress Analysis.** C. V. Mahlmann and W. M. Murray, editors. v. 14, No. I, 214 p. 1956. Society for Experimental Stress Analysis, Central Square Station, P.O. Box 168, Cambridge 39, Mass.

A collection of 24 papers; pertinent ones are abstracted individually. (Q25, Q general)

299-Q. **Prediction of Twinning Modes in Metal Crystals.** M. A. Jaswon and D. B. Dove. *Acta Crystallographica*, v. 10, Jan. 10, 1957, p. 14-18.

New method of crystallographic analysis of deformation twinning in multiple lattices. This enables the operative twinning modes to be predicted for all metal crystals, including alpha-uranium. Reasons for the nonappearance of certain modes expected theoretically. (Q24b, M26)

300-Q. **Effects of Grain Boundaries on the Plastic Deformation of Zinc Crystals.** G. B. Craig and B. Chalmers. *Canadian Journal of Physics*, v. 35, Jan. 1957, p. 38-47.

Investigations of tensile plastic deformation of single-crystal and tricrystal specimens of zinc by analysis of the external change and of the change in X-ray diffraction pattern.
(Q24; Zn)

301-Q. **Some Aspects of the Plastic Design of Aluminum Structures.** S. K. Ghaswala. *International Association for Bridge and Structural Engineers, Publications*, v. 16, 1956, p. 231-254.

Evaluation of the theories of plasticity in designing aluminum structures; survey of fields of bending, torsion, inelastic stability, plate stability, compression and frameworks; recent ideas on strength in terms of cohesive slip and cohesive resistance. 94 ref.
(Q general, T26, 17-1; Al)

302-Q. **Mechanical Properties of Flake Graphite Cast Irons.** G. N. J. Gilbert. *Iron and Steel*, v. 30, Feb. 1957, p. 45-51.

Modulus of elasticity, Brinell hardness, general relationship between chemical composition, cooling rate and mechanical properties. 41 ref.
(Q21a, Q29n; CI)

303-Q. **Properties of Materials at Very High Temperatures.** *Materials and Methods*, v. 45, no. 2, Feb. 1957, p. 151, 153. (CMA)

Short-time tensile, creep and fracture properties at high temperatures and rapid rates of loading were studied for molybdenum, copper, iron, tantalum and graphite. At equal temperatures molybdenum and tantalum are better than iron or copper, but are subject to oxidative attack.
(Q26, Q27a, Q3m, 2-12; Mo, Cu, Fe, Ta, C)

304-Q. **Molybdenum as an Alloy Addition for Titanium.** H. Margolin. *Metal Progress*, v. 71, Feb. 1957, p. 86-91. (CMA)

Alpha and beta alloying additions for titanium are discussed generally. Ti-Al alloys have low strength at intermediate temperatures and therefore aluminum is used as an α stabilizer in α-β alloys, thus contributing to the high-temperature strength. Iron and chromium form compounds and, if present, must be offset by molybdenum, vanadium or manganese. A Ti-7Al-3Mo alloy was studied; its creep strength is better than that of Ti-6Al-4V, and the strength-weight ratio is superior to that of all competitors. The as-welded sheet is brittle and sheet forming appears to be difficult. Adding zirconium or tin is beneficial. Hardenability of titanium alloys is discussed. Molybdenum leads to greater tolerance of hydrogen.
(Q general, 2-10; Ti, *Mo*)

305-Q. **Possible Mechanism for the Fracture of Metals.** Eiichi Fujita. *Physical Society of Japan, Journal*, v. 11, Nov. 1956, p. 1201.

Theoretical consideration of Griffith crack. 6 ref. (Q26)

306-Q. **Nitrogen Improves Valve Steel.** *Steel*, v. 140, Feb. 18, 1957, p. 169-172.

Tensile data analysis and valve life for new high-nitrogen autenitic steel (21-4N).
(Q27a, T7; SS-e, *N*)

307-Q. Buckling Limits in Contour Forming. Part I. William W. Wood. *Tool Engineer,* v. 38, Feb. 1957, p. 85-91.

Factors which lead to buckling and formability indexes for a number of materials used in aircraft design. (Q28g, Q23q, G9)

308-Q. Spring Back of Metals. F. J. Gardiner. *Transactions of the ASME,* v. 79, Jan. 1957, p. 1-9.

A generalized and simplified mathematical analysis and derivation for springback correction curves for pure bending. (Q5)

309-Q. On the Applicability of Notch Tensile Test Data to Strength Criteria in Engineering Design. J. D. Lubahn. *Transactions of the ASME,* v. 79, Jan. 1957, p. 111-115.

Current applicability of notch-test results to engineering problems, importance of stress calculations to engineering design, problems of developing a design procedure for prevention of fracturing. 18 ref.
(Q27d, 17-1)

310-Q. Creep Damage in a Cr-Mo-V Steel as Measured by Retained Stress-Rupture Properties. M. H. Jones, D. P. Newman and W. F. Brown. *Transactions of the ASME,* v. 79, Jan. 1957, p. 117-120.

Deterioration during creep at 1000° F. measured by the retained 1100° F. stress-rupture properties. Mathematical procedure, results, mechanism of damages. 12 ref.
(Q3m; AY)

311-Q. Residual Stress in Cold Extruded Aluminum. J. Frisch and E. G. Thomsen. *Transactions of the ASME,* v. 79, Jan. 1957, p. 155-160.

A 1.5-in. diameter cylindrical bar was extruded at room temperature from an 1100-0 (25-0) aluminum diameter billet, 4.3 in. Residual stresses determined from the axially relaxed stresses in the billet during extruding. 6 ref. (Q25h, G5; Al)

312-Q. Effect of Frequency and Temperature on Fatigue of Metals. S. R. Valuri. *U.S. National Advisory Committee for Aeronautics. Technical Note* 3972, Feb. 1957, 15 p.

Fatigue problem from viewpoint of two-component system. (Q7, 2-11)

313-Q. (English.) **Creep of Low-Carbon Steel Under Interrupted Stressing.** Tosho Nishimura, Shuji Taira, Kichinosuke Tanaka and Kyotsugu Ohji. *Kyoto Daigaku Kenkyushyo Kenkyu Hokoku,* v. 6, Oct. 1956, p. 127-145.

Results of constant stress tests and creep tests under interrupted stressing. Theoretical consideration and discussion. 24 ref.
(Q3r, Q3s; CN-g)

314-Q. (French.) **Special Cast Irons and Their Applications in the Mineral Industry.** G. Henon. *Revue Générale de Mécanique,* no. 95, Dec. 1956, p. 407-413.

The general and mechanical characteristics of various types of cast iron. Applications in the mineral and hydraulics industries.
(Q general, W15, 17-7; CI)

315-Q. (Japanese.) **Creep of Mild Steel.** Toshio Mishihara, Shuji Taira and Kichinosuke Tanaka. *Kyoto Daigaku Kenkyushyo Kenkyu Hakoku,* v. 6, Aug. 1956, p. 99-125.

Creep behavior under constant tensile stress. By the rheological analysis of the creep strain, a formula which represents stress-strain-time relation was introduced. By using the formula, tension test results, bending creep test results and creep test results under combined stress are interrelated with the data of tension creep test. 9 ref.
(Q3r; CN)

316-Q. (Japanese.) **Bearing Steel Manufactured by Acid Openhearth and Basic Electric Furnace.** Ueno. *Nippon Kikai Gakaishi,* v. 59, Dec. 1956, p. 891-897.

Chemical composition of nonmetallic inclusions; mechanical properties of the bearing steel. 8 ref.
(Q general; ST-e, ST-f, SGA-c)

317-Q. (Japanese.) **On the Changes of Mechanical Properties and Microstructures of Commercially Pure Titanium Sheets by Cold Rolling and Annealing.** Yutaka Kondo. *Sumitomo Metals,* v. 8, Oct. 1956, p. 201-220.

Experimental studies on the changes of mechanical properties and microstructures of various commercial titanium sheets by cold rolling and annealing. 28 ref.
(Q general, M27a; 2-14, 3-18; Ti, 4-3)

318-Q. (Japanese.) **Effects of Titanium on the Properties of Binary Cu Alloys.** Rihei Kawachi. *Sumitomo Metals,* v. 8, Oct. 1956, p. 229-235.

Microstructure and hardness in cast, annealed, quenched and cold worked states. (Q29n, M27; Cu, *Ti*)

319-Q. (Russian.) **Instrument for Determining the Hardness of Aircraft Engine Cylinder Walls.** M. M. Khruschev, Ye.S. Berkovich and M. D. Krashchin. *Priebery i Stendy,* no. P-564-460, 1956, p. 3-7.

The microscope of the ImASh (Institute of Machine Science) has but one 40× lens. The diagonals of the diamond-made indentations are measured with the 10× ocular micrometer AM9-1. Loads of 100 and 200 g. are used in the ImASh instrument. (Q29q; 1-2)

320-Q. Dislocation Theory of Plastic Bending. W. T. Read, Jr. *Acta Metallurgica,* v. 5, Feb. 1957, p. 83-88.

The macroscopic stress (average stress in a volume containing many dislocations) in a uniformly bent crystal is related to the dislocation density by a simple differential equation analogous to Poisson's equation. Differences between bending and tension tests give information about the dislocation mechanism of deformation. (Q24f, Q27, Q5, 1-4)

321-Q. The Yield Strength of Partly Ordered F.C.C. Structures. H. J. Logie. *Acta Metallurgica,* v. 5, Feb. 1957, p. 106-109.

Partly ordered alloys (of face-centered cubic structures) show a dependence of yield strength on the size of the ordered domains. By considering the increase in disorder as slip progresses, a value for the yield strength is obtained in terms of the domain size which is in good agreement with experimental values. (Q23b, N10)

322-Q. Flexibility of Thin Porcelain Enameled Sheet Steel. A. G. Eubanks, J. R. Crandal and J. C. Richmond. *American Ceramic Society, Bulletin,* v. 36, Feb. 1957, p. 59-63.

Low-carbon steel strips of 0.004, 0.007 and 0.010-in. thickness were given porcelain enamel applications ranging from 0.0017 to 0.0063 in. thick, deformed around cylindrical blocks of various radii of curvatures and inspected to determine if failure of the enamel by cracking had occurred. It was found that the failure radius ranged from 1½ to 4 in., depending upon the thickness of the enameled strip, the thicker strips failing at larger ratio. (Q5g; ST, 8-21, 4-3)

323-Q. Effect of Stress on Creep at High Temperatures. H. Lakes, C. D. Wiseman, U. D. Sherby and J. E. Dorn. *American Society of Mechanical Engineers,* Preprint no. 56-A-55, Nov. 1956, 7 p.

Experimental investigation on pure aluminum and its dilute solution alloys revealed that the high-temperature creep rate is related to the stress. According to a preliminary dislocation-climb model for high-temperature creep, the activation energy for creep is that for self-diffusion and the effects of stress on the creep rate depend on the number of active Frank-Reed sources, and the rate of climb depends on the structure as determined by the pattern of climbing dislocations. 14 ref. (Q3m, 2-12, 3-16; Al)

324-Q. Fatigue of Metals Under Combinations of Stress. W. N. Findley. *American Society of Mechanical Engineers,* Preprint no. 56-A-74, Jan. 10, 1957, 11 p.

Analysis of available information suggests that the phenomenon of fatigue of materials results primarily from alternating stress producing cracks along shear planes, and that the resistance to fatigue cracking is influenced by other factors. Some of these factors are changes in structure of the material resulting from plastic and elastic stressing as well as heat treatment. (Q7)

325-Q. Delayed-Yield Time Effects in Mild Steel Under Oscillatory Axial Loads. R. O. Belsheim. *American Society of Mechanical Engineers,* Preprint no. 56-A-108, Nov. 1956, 7 p.

An apparatus was developed which loads a tension specimen by a vibratory load superimposed on a static load. Tests of mild steel produced (a) dynamic yield points 5 to 50% above the static yield point, and (b) corresponding delayed-yield time of 1000 to 10 milliseconds. 23 ref. (Q23b, 1-2; CN)

326-Q. The Flow and Fracture of Nodular Cast Iron. W. R. Clouch and M. E. Shank. *American Society of Mechanical Engineers,* Preprint no. 56-A-110, Nov. 1956.

The phenomenon of fatigue of materials results primarily from alternating shearing stress producing cracks along shear planes. The resistance to fatigue cracking is influenced by various factors. Some of these factors are changes in structure of the material resulting from plastic and elastic stressing and heat treatment. 23 ref. (Q7; CI-r)

327-Q. Chromium-Molybdenum and Chromium - Molybdenum - Vanadium

Steels for Power Plant and Refinery Service up to 1100° F. George V. Smith. *American Society of Mechanical Engineers,* Preprint no. 56-A-214, Nov. 1956, 32 p.

Effects of composition and heat treatment on strength; introduction of other properties such as creep, structural stability, stress at various temperatures; fabrication characteristics. 76 ref.
(Q general, 2-12, W11, 17-7; AY)

328-Q. Austenitic Steels in High Temperature Steam Piping. R. M. Curren and A. W. Ranlun. *American Society of Mechanical Engineers,* Preprint no. 56-A-217, Nov. 1956, 16 p.

Review of high-temperature properties of the available steels. Cracking occurring in and adjacent to welded joints in austenitic steels has deterred more widespread application. Suggestions for minimizing difficulties encountered with austenitic piping materials are given. 5 ref.
(Q general, 2-12, 9-22, W10; SS-e)

329-Q. High Temperature Magnesium for Supersonic Aircraft. *Automotive Industries,* v. 116, Feb. 15, 1957, p. 66-69.

Magnesium-thorium alloys for light-weight, high-temperature requirements for supersonic structural airframe components. Mechanical properties of magnesium-thorium alloys, HK31A and HM21XA-T8, have been investigated.
(Q general, 2-12, T24; Mg, SGB-s)

330-Q. A Preliminary Study of Three Cermets Based on Uranium Oxide. L. S. Williams, D. T. Livey and R. Murry. *British Atomic Energy Research Establishments,* A.E.R.E. M/R 1934, 1956, 26 p.

The fabrication and some properties of three cermets investigated in outline. The thermal shock properties of uranium oxide are not improved by the addition of zirconium. The use of silicon as the metallic constituent at 20% by volume improves the oxidation resistance of uranium oxide in air at temperatures up to 900° C. 11 ref.
(Q10a, R1h; U, *Zr,* 6-20)

331-Q. Tensile Fracture of Ductile Metals. H. H. Bleakney. *Canadian Metals,* v. 20, Feb. 1957, p. 60-64.

Tension tests of aluminum and heat treated mild steel revealed three modes of fracture; fracture with 100% reduction of area and fracture with slowly or rapidly growing features. Data suggested that true stress at fracture is not experimentally determinable by methods presently known. 7 ref.
(Q26r, Q27a; Al, CN)

332-Q. Wear Protection of Mild Steel by Phosphating. J. W. Midgley. *Iron and Steel Institute, Journal,* v. 185, Feb. 1957, p. 215-227.

A study is made by microscopy of the change in the nature of mild steel surfaces phosphated in an accelerated iron phosphate, or an accelerated iron manganese phosphate bath, and of the changes during subsequent wear tests. 23 ref.
(Q9n, L14b; CN)

333-Q. Properties of Materials at Very High Temperatures. J. R. Kattus. *Materials and Methods,* v. 45, Feb. 1957, p. 151-153.

Comparison of tensile strength, modulus of elasticity, yield strength and elongation at high temperatures for molybdenum, tantalum, iron, copper and graphite.
(Q27a, Q21a, Q23b, 2-12; Mo, Ta, Fe, Cu, NM-k36)

334-Q. Metallurgical Yield-Stress Observation. Joseph William Jacobson. *Mechanical Engineering,* v. 79, Jan. 1957, p. 13-15.

Use of metallography in the study of mechanism of failure within the grain structure. Results are presented in the form of micrographs, giving a visible reproduction of materials under load. (Q23b, M21)

335-Q. Improved Silicon Carbide. *Mechanical World and Engineering Record,* v. 137, Feb. 1957, p. 59.

New material possessing higher flexural strength, higher stiffness, lower permeability, better thermal properties and higher abrasive resistance than conventional silicon carbide. Silicon carbide itself is used as the bonding material.
(Q general, P11; Si)

336-Q. Influence of Temperature on Metallic Wear. J. K. Lancaster. *Physical Society Proceedings, Section B,* v. 70, Jan. 1, 1957, p. 112-118.

The influence of temperature on the wear rate of 60-40 brass on tool-steel has been investigated over the range 20 to 600° C. Two regimes of wear were found. At low temperatures, extensive intermetallic contact and welding occur, and the wear rate increases with increasing temperatures. At high temperatures the wear rate decreases by several orders of magnitude and protective surface films are generated during sliding. 8 ref. (Q9n, 2-11; Cu-n, TS)

337-Q. On the Mechanism of High-Temperature Creep in Metals With Special Reference to Polycrystalline Lead. P. Feltham. *Proceedings of the Physical Society,* v. 69B, Dec. 1, 1956, p. 1173-1188.

On the basis of Mott's suggestions that intracrystalline deformation in creep takes place by fine slip, and that the activation energy is that for the formation of screw dislocations impeded by jogs, expression for the high-temperature transient and equilibrium creep rate are given in terms of applied stress, temperature, the grain size and the characteristics of the intragranular substructure. 31 ref. (Q3m, 2-12; Pb)

338-Q. An Examination of a Mild Wear Process. J. F. Archard and W. Hirst. *Royal Society, Proceedings,* Series A, v. 238, Jan. 29, 1957, p. 515-528.

A detailed study of the wear of hardened high speed toolsteel rubbing on itself at a speed of 66 cms. under loads of a few kilograms. Radioactive tracers, optical microscopy, reflection and replica electron microscopy, and other methods of surface examination have been used. 13 ref. (Q9n, 1-4; TS-m)

339-Q. Effect of a Tangential Force on the Contact of Metallic Bodies. J. S. Courtney-Pratt and E. Eisner. *Royal Society, Proceedings* Series A, v. 238, Jan. 29, 1957, p. 529-550.

Examination of the tangential movement of two bodies relative to each other and the size of the area of contact between them, when they are first loaded normally and then subjected to tangential forces too small to cause sliding. Investigation of the contact of like metallic specimens, using gold, platinum, tin, indium and mild steel. 36 ref. (Q9p; Au, Pt, Zn, In, CN)

340-Q. Buckling Limits in Contour Forming, Part II. William W. Wood. *Tool Engineer,* v. 38, Mar. 1957, p. 105-113.

Plate buckling is the primary cause of failure when forming curved flanges. The author has developed formability limit curves which make it possible to predict whether a curved flange can be formed without buckling. Other forming limits are also covered. (Q28g, Q23q, G9)

341-Q. Cast Copper Anti-Friction Steel. A. A. Lunev. University of Alabama (U.S. Bureau of Ships) U.S. Office of Technical Services, P.B. 121364, Jan. 1955, 15 p. (Translation from *Liteinoe Proizvodstvo.*)

Previously abstracted from original. See item 650-Q, 1955. (Q9, AY, SG-c)

342-Q. (English.) **Internal Friction Due to Water in Copper.** Shosuke Imoto and Genjivo Mima. *Osaka University, Technology Reports,* v. 6, Mar. 1956, p. 141-144.

A copper polycrystalline specimen which contained 0.2% oxygen was heated in a hydrogen atmosphere till it no longer absorbed hydrogen. The internal friction was measured on this specimen under gradually increasing temperature from −10° C. Then a peak appeared on the internal friction vs. temperature curve near 0 °C. (Q22, 1-14; Cu)

343-Q. (French.) **Influence of the Nature of the Mold on the Mechanical Characteristics of Nonalloyed Gray Cast Iron.** Michel Ferry. *Fonderie,* no. 132, Jan. 1957, p. 15-23.

Comparative study of the mechanical properties (such as modulus of elasticity and Brinell hardness) of rough-cast bars with bars heat treated to form a ferritic structure in order to determine the respective roles played by the mold and by graphite. 5 ref. (Q1a, Q29n, W19; CI-n)

344-Q. (Russian.) **High Heat Stable Indentors for Measuring the Hardness of Metals When Heated to 1300° in a Vacuum.** M. G. Lozinskiy and M. B. Guterman. *Zavodskaya Laboratoriya,* v. 22, no. 11, 1956, p. 1358-1363.

For extending the temperature range of the tests and increasing the longevity of the indentor tips it was necessary to find new materials capable of replacing the technical diamonds being used. As the result of many comparative tests, synthetic corundum (artificial sapphire) tips were found to be most suitable for measuring alloy hardness at temperatures up to 1300°, under vacuum. (Q29b, 2-12, 1-23)

345-Q. Formability Index Determines Minimum Bend Radius. William W. Wood. *American Machinist,* v. 101, Feb. 25, 1957, p. 121-125.

Need for method for finding minimum bend radius of various sheet metal materials led to development of a formability index (true strain/average tensile yield strength). Use of formability index in nomograph

allows direct determination of minimum bend radius. Results indicate present manufacturers' standards are too conservative. (Q23q, G6)

346-Q. Today's Frontiers in High Temperature Technology. N. K. Hiester, F. A. Ferguson and N. Fishman. *Chemical Engineering,* v. 64, Mar. 1957, p. 237-252.

Obtaining high temperatures by electrothermal, metallurgical and combustion processes, chemical and impulse methods, radiation and nuclear reactors. Materials which have high resistance to temperature, such as metals, metallic compounds and cermets are considered.
(Q general, 2-12; SGA-h)

347-Q. Magnesium-Thorium Alloys. Donald Mathews. *Magnesium,* Feb. 1957, p. 4-7; disc., p. 10-16.

Evaluation of magnesium-thorium alloys for use in short-time guided missiles, including HK31 and AZ31 sheet, HK31 and HZ32 sand castings. Temperature, stiffness and resistance to buckling are considered in connection with minimum weight. Need for an improved die-casting alloy is discussed.
(Q28g, 2-12, T2; Mg, Th)

348-Q. On the Mechanism of Work Hardening in Face Centered Cubic Metals With Special Reference to Polycrystalline Copper. P. Feltham and J. D. Meakin. *Philosophical Magazine,* v. 2, Series 8, Jan. 1957, p. 105-112.

Tensile specimens of oxygen-free polycrystalline copper (99.991%) were annealed for various periods in vacuo, in the range 500-700° C. so as to obtain variations in the grain sizes and yield points. 8 ref.
(Q23a, J23; Cu)

349-Q. The Nature of Persistent Slip Bands in Fatigued Copper. D. S. Kemsley. *Philosophical Magazine,* v. 2, Series 8, Jan. 1957, p. 131-132.

Evidence of the nature of persistent slip bands obtained during metallographic work on rotating cantilever fatigue specimens of annealed high-conductivity copper.
(Q24a, Q7; Cu)

350-Q. (German.) **Sonic Treatment of Metallic Metals.** H. J. Seemann and H. Staats. *Acustica,* v. 6, no. 4, 1956, p. 325-334.

Electrodynamic methods are compared. An instrument suitable for investigation of sonic properties is described, and results obtained with different materials are discussed. 9 ref. (Q21f, E25q, 1-3)

351-Q. (German.) **Wave Velocity of Metals at Their Melting Point.** Werner Schaffs. *Acustica,* v. 6, no. 4, 1956, p. 387-390.

At the melting point of zinc, cadmium, tin, lead, bismuth, mercury, sodium, potassium, rubidium, cesium and gallium, the velocities quotient for longitudinal waves in solid and liquid phases is approximately 1.26. The velocities quotient for dilational waves in the solid phase and for longitudinal waves in the liquid phase is approximately 1.03, or for practical purposes 1. 7 ref.
(Q21f, P12n)

352-Q. (German.) **Susceptibility to Cracking of Concrete Reinforcing Steel Bars With Cross Ribs.** Werner Lückerath. *Stahl und Eisen,* v. 77, Jan. 10, 1957, p. 11-15.

About 5000 cross-ribbed concrete reinforcing steel bars with diameters from ¼ to 1 in. were used for reverse bending tests with different angles of bending. Cracking occurred near cross ribs. (Q5, T26a; ST, 9-22)

353-Q. (German.) **Theory of Plasticity. IV.** Alfred Seeger. *Zeitschrift für Naturforschung,* v. 11a, Dec. 1956, p. 985-998.

Plastic behavior of metals with hexagonal crystal structures (i.e. zinc, cadmium and magnesium). 80 ref. (Q24, M26n; Zn, Cd, Mg)

354-Q. (Italian.) **Theoretical and Technical Study of Plastic Flexure. Part I. Qualitative Examination of the Problem of Deformation.** Riccardo Levi. *Ingegneria Meccanica,* April 1956, p. 23-27.

Deals with sheet metal in general, mild steel in particular, both under simple bending and simultaneous tensile stresses. Results of constancy of volume on deformation; mechanics of plastic flexure; practical examples. (To be continued.)
(Q24, Q5; CN, 4-3)

355-Q. (Italian.) **Theoretical and Technical Study of Plastic Flexure. Part II. Quantitative Examination of the Problems of Plastic Deformation.** Riccardo Levi. *Ingegneria Meccanica,* v. 5, May 1956, p. 5-15.

Deals with sheet metal in general, mild steel in particular. Use of experimental data discussed; basic equations interpreted.
(Q24; CN, 4-3)

356-Q. (Italian.) **Function of Layers of Metallic Oxides on Lubrication Surfaces.** Arnaldo Recine. *Ingegneria Meccanica,* v. 5, Aug. 1956, p. 45-48.

Protective role of metallic oxides on lubrication surfaces; prevention of direct contact of metals and therefore of binding. Study of physical and mechanical properties of layers of metallic oxides reveals why certain metals are generally excluded from use in metal construction. (Q9p)

357-Q. (Italian.) **High-Quality Light Alloys for Mechanical Construction.** Arrigo Perrone. *Ingegneria Meccanica,* v. 5, Sept. 1956, p. 9-16.

General characteristics of aluminum and its cast and wrought alloys, from point of view of composition, response to improvement and use. Applications of these alloys in mechanical construction, and reactions to tension, compression, combined compressive and bending stresses, cutting, torsion, both "cold" and at high temperatures. General criteria for selection of aluminum alloys. (Q general, T26; Al)

358-Q. Residual Stresses in Thorium Slugs. J. W. Joseph, Jr., and J. W. Walker. E. I. duPont de Nemours and Co. *U.S. Atomic Energy Commission,* DP-169, Sept. 1956, 28 p.

Residual stresses of 2000 to 8000 psi. in compression were measured at the surface of cylindrical slugs of thorium. The stresses were measured by boring holes in the slugs and measuring the resulting surface deformation with strain gages. The tensile stresses that result from thermal gradients in the slugs during irradiation are partially counteracted by these residual stresses. (Q25h, 1-4, 2-17; Th)

359-Q. Effects of Irradiation on the Tensile Properties of Uranium. R. E. Hueschen, R. S. Kemper and W. S. Kelly. General Electric Co., *U.S. Atomic Energy Commission,* HW-41690, Feb. 9, 1955, 28 p.

Effect of neutron irradiation on the tensile properties of uranium determined at room and at elevated temperatures. Evaluation of the test results shows that damage may be a serious deterrent to competitive operation of nuclear power plants. 17 ref. (Q27a, 2-17, W11; U)

360-Q. Performance of Stainless Steel Sandwich Construction at High Temperatures. V. C. Setterholm and E. W. Kuenzi. Forest Products Laboratory (Wright Air Development Center). *U.S. Office of Technical Services,* PB 121681, Sept. 1956, 39 p. $1.00.

New all-metal sandwich material, composed of a light-weight core of stainless steel honeycomb with stainless steel facings, has shown promise as a high-temperature material for construction of airframes for high-speed aircraft. This report contains results of tests of strength properties of various types of metal sandwich construction. (Q27a, 2-12, T24a; SS, 7-9)

361-Q. The Principles of Dispersion Hardening Which Promote High-Temperature Strength in Iron-Base Alloys. E. E. Underwood, A. R. Elsea and G. K. Manning. Battelle Memorial Institute (Wright Air Development Center). *U.S. Office of Technical Services,* PB 121455, June 1956, 68 p. $1.75.

Goal of this investigation was to determine the underlying principles affecting the high-temperature strength of particulate iron-base alloys. Creep strengths, tensile strengths and hot hardness were measured at 80 to 1200° F. in single-phase ternary alloys with a base composition of iron with 20% chromium. Ternary additions were titanium, beryllium or boron. Hardnesses of ternary alloys were correlated by a function of lattice strain and relative valence. (Q3m, Q27a, Q29n, 2-12; SGA-h)

362-Q. Mechanical Properties of Porosity-Graded 195 Alloy: Part I—Tensile Properties. I. J. Feinberg (U.S. Naval Ordnance Laboratory) *U.S. Office of Technical Services,* PB 121456, June 1956, 44 p. $1.25.

The correlation of the radiographic appearance of discontinuities with mechanical properties in light alloy castings. A study was made on the effects of hydrogen gas porosity on the tensile properties of 195 alloy casting material. Metallographic illustrations of elongated hydrogen gas porosity in the test material are presented, providing base required for association with derived tensile properties. (Q27a, P10m, S13e; Al, 5)

363-Q. Mechanical Property, Corrosion and Welding Studies on 6066 Aluminum Alloy. J. D. Wood. (Wright Air Development Center) *U.S. Office of Technical Services,* PB 121497, June 1956, 36 p. $1.00.

Aluminum alloy 6066, an aluminum-magnesium-silicon-copper-man-

ganese-chromium alloy was evaluated as a material for use in Air Force weapons systems.
(Q general, R general, K9s; Al)

364-Q. Survey of Low-Alloy Aircraft Steels Heat Treated to High-Strength—Part 4. High Strength Steel Levels and Their General Static Properties. G. Sachs and E. P. Klier. Syracuse University (Wright Air Development Center). *U.S. Office of Technical Services,* PB 121504, Aug. 1954, 145 p. $3.75.

Factors considered in selecting high-strength steels and assemblies, the available information on the effects of the numerous variables encountered in making, shaping and heat treating low-alloy steels, and their significance for the strength properties of aircraft parts.
(Q23b, T24; AY-n)

365-Q. Survey of Low-Alloy Aircraft Steels Heat Treated to High-Strength Levels. Part 5. E. P. Klier. Syracuse University (Wright Air Development Center). *U.S. Office of Technical Services,* PB 121505, Sept. 1954, 150 p. $3.75.

Results of impact tests and notch-tension tests on high-strength steels. The impact strength of constructional low-alloy steels generally exhibits a minimum at tempering temperatures between 500 and 700° F. for short tempering times, making preferable steels tempered either at 400 or over 800° F. High-strength steels with optimum impact strength at a given strength level are obtained by holding the carbon content as low as possible.
(Q6n, Q27d, 2-14; AY)

366-Q. Survey of Low-Alloy Aircraft Steels Heat Treated to High-Strength Levels—Part 6. Recommendations for Future Research Work on High-Strength Steels. G. Sachs and E. P. Klier. Syracuse University (Wright Air Development Center). *U.S. Office of Technical Services,* PB 121506, Sept. 1954, 9 p. $.50.

An integrated over-all program is proposed for the study of a considerable number of pertinent properties of 4340 steel and a few competitive steels and the development of design data for these is recommended for future work. Consideration of the effects of commercial variations and limitations in carbon and alloy constituents, ingot size, steelmaking and breaking-down practices is particularly desired.
(Q23b, T24; AY-n)

367-Q. Investigation of Stress-Relief Procedures for Titanium and Titanium Alloys. F. J. Gillig. Cornell Aeronautical Laboratory (U.S. Wright Air Development Center). *U.S. Office of Tecnical Services,* PB 121570, Aug. 1956, 82 p. $2.25.

Causes and effects of residual stresses in titanium aircraft parts, and development of thermal treatments to relieve the stresses. Fundamental principles for the build-up of residual stresses are reviewed. The difference between micro and macrostresses and the relationship between these stresses and the properties of the material are discussed.
(Q25h, J1a; Ti)

368-Q. Mechanical Properties and Corrosion Behavior of Zircaloy-3. F. Forscher, S. Kass and K. Goldman. *U.S. Atomic Energy Commission,* TID-7526 (Pt. 1), Feb. 1957, p. 69-88. (CMA)

A comparison of the mechanical and corrosion properties of Zircaloy-2, 3a, 3b and 3c shows that Zircaloy-2 is the strongest and Zircaloy-3a is the weakest, that ductility is much the same, and that the post-transition corrosion rate of Zircaloy-3a in 750° F. steam and 600° F. water is the lowest. In the pretransition state the corrosion rates are all similar. (Q general, R4; Zr)

369-Q. On the Mechanical Metallurgy of Zircaloy-3b. D. E. Johnson. *U.S. Atomic Energy Commission,* TID-7526 (Pt. 1), Feb. 1957, p. 65-68. (CMA)

Tensile properties in Zircaloy-3b were tested using annealed and cold worked specimens; tests were conducted at −50, 22, 100, 200 and 300° C. Strength is good although less than in Zircaloy-2. Evidence of low-temperature aging appeared in water-quenched specimens. The ductility of cold-worked specimens may be restored by short-time annealing.
(Q27a, 2-15; Zr)

370-Q. (Book.) **Report on Elevated-Temperature Properties of Wrought Medium-Carbon Alloy Steels.** American Society for Testing Materials. Special Technical Publication, SPT 199, 1957, 127 p. $4.25.

Graphical summary of the elevated-temperature strength data for medium-carbon alloy steels. Includes summary curves for tensile strength; 0.2% offset yield strength; per cent elongation and reduction in area; stresses for rupture in 100, 1000, 10,000 and 100,000 hr.; and stresses for creep rates of 0.0001 and 0.00001%

per hr. (1% in 10,000 and 100,000 hr.). Data for 27 steels representing approximately a dozen alloy types are given.
(Q27a, Q23b, Q3m, 2-12; AY)

371-Q. Materials—Key to Superspeed Aircraft. *ASTM Bulletin,* No. 220, Feb. 1957, p. 18-20.

Problems of superspeed, and testing materials and assemblies at high temperature.
(Q general, 2-12, T24, SGA-h)

372-Q. Theory of Plastic Deformation of Metals. N. S. Akulow and P. P. Galenko. *British Atomic Energy Research Establishment,* A.E.R.E. Lib/Trans 672, Aug. 1956, 4 p. (Translated from *Doklady Akademii Nauk SSR,* v. 103, July 1955, p. 387-390).

Previously abstracted from original. See item 973-Q, 1955. (Q24)

373-Q. How Ceramic Coatings Affect Creep of Alloys. *Ceramic Industry,* v. 68, March 1957, p. 58, 94, 95.

Creep curves for two coated and uncoated 80% Ni, 20% Cr alloys under stress at an elevated temperature. Results show that the beneficial effect on the creep behavior of both alloys is sufficient to be of practical importance.
(Q3m; Ni, Cr, 8-21)

374-Q. Effect of Interrupted Loading on Mechanical Properties of Metals. E. V. Evans. *Engineer,* Feb. 22, 1957, p. 292-294.

For a range of metals increased elongation of fracture may be obtained in tensile tests if the specimen is repeatedly loaded and unloaded, the strain increasing by small increments in each cycle. (Q27e)

375-Q. Metallurgy of Cutting Tools, Part II—Heat Measurement and Hot Hardness. K. G. Lewis. *Iron and Coal Trade Review,* v. 174, Feb. 15, 1957, p. 399-404.

Comparison of some methods used to measure the heat developed in cutting. There are three properties of cutting tools which greatly affect their machining ability—hot hardness, toughness and wear resistance. Hot hardness is discussed in this part. (Q19p; SGA-j)

376-Q. Properties of Silicon Diffusion Coating. A. S. Akopdzhanyan and N. S. Garbundy. *Journal of Applied Chemistry of the USSR,* v. 29, May 1956, p. 717-720. (Translated by Consultants Bureau, 227 W. 17th St., New York 11, N.Y.)

Silicon-coated iron is resistant to the action of such corrosive media as 10% aqueous solutions of sulphuric, hydrochloric and phosphoric acids, and aqueous solutions of 3% sodium chloride, 5% calcium chloride, and 5% sodium sulphate. Microhardness and abrasion tests showed that diffusion layers of silicon have considerably higher hardness and wear resistance than original iron.
(Q29n, Q9n; Fe, *Si,* 8-24)

377-Q. Compressional Creep of Tin Single Crystals. J. Weertman. *Journal of Applied Physics,* v. 28, Feb. 1957, p. 196-197.

Compressional creep tests were run on single crystals oriented so that the direction of compression was along the C axis. Two activation energies of creep were found; approximately 24,500 cal. per mol above 120° C. and 12,000 cal. per mol below this temperature.
(Q3c; Sn, 14-11)

378-Q. On Primary Creep. N. J. Hoff. *Journal of the Mechanics and Physics of Solids,* v. 5, Mar. 1957, p. 150-151.

To show that the presence of variations in the properties of the individual crystals of a polycrystalline aggregate the assumption that only two mechanisms of deformation exist, namely one of linear elasticity and one of nonlinear steady (or secondary) creep suffices to explain the existence of primary (or transient) creep. (Q3)

379-Q. Study on Magnesium Alloys Containing Zirconium. I. On the Properties of Rolled Mg-Zr Alloys. H. Tanaka and K. Soutome. *Light Metals (Tokyo),* v. 7, Jan. 1957, p. 62-68. (CMA)

The addition of zirconium to wrought (rolled) magnesium alloys was studied. The refined ingot structure resulted in better ingot working. Strength of the orientation decreases as the amount of zirconium increases. Ductility was improved and the recrystallization temperature was increased.
(Q23p, N5; Mg, *Zr,* 4)

380-Q. Fatigue of Aircraft. P. L. Teed. *Machinery Lloyd,* v. 29, Feb. 16, 1957, p. 70-78.

Fatigue of aircraft from the viewpoint of stress concentrations and built-in stress. (Q7, T24)

381-Q. Neutron Radiation Effects on Tensile and Impact Properties of

ASTM-A302 B Steel. E. E. Baldwin. *Mechanical Engineering,* v. 79, March 1957, p. 261-265.

Effect of the operating conditions of temperature and radiation upon the tensile and impact strengths of the structural material to be used for pressurized-water-reactor pressure vessels.
(Q27a, Q6n, 2-17, W11, 17-7)

382-Q. Cracking Tendency in Heavy High-Temperature Steam Piping. Henry M. Soldan and Charles R. Mayne. *Metal Progress,* v. 71, Mar. 1957, p. 78-85.

Stabilized 18-8 (Type 347) is the conventional material for high-temperature steam service. Occasional cracks alongside welds may be avoided by using metal and welding electrodes (like 16-8-2 Cr-Ni-Mo) which have 60% reduction of area or more when cooled from 2400° F. and tested at 2300° F.
(Q23p, 2-12; SS, 1-7, 9-22)

383-Q. Brittle Fracture of Sheet Piling. W. A. Morgan and R. C. A. Thurston. *Metal Progress,* v. 71, Mar. 1957, p. 86-91.

Sheet piling is usually rolled of structural steel which can meet moderate requirements. While service records are good, several failures in Canadian waters indicate that its transition temperature, where fatigue cracks or corrosion pits lead to catastrophic brittle fracture, is well above the water temperature.
(Q26s, T26; AY, CN)

384-Q. Testing Quality of Spring Steel. William R. Johnson. *Steel,* v. 140, Mar. 11, 1957, p. 185-188.

Special set point test, fatigue test, formability test and break test are used, with hardness and microstructure testing, to determine steels suitable for springs.
(Q general; ST, SGA-b)

385-Q. The Strengthening of Beryllium for High-Temperature Use by Means of Beryllium Oxide and Beryllium Carbide Dispersions. J. Greenspan. Paper from "Metallurgical Information Meeting, Ames Laboratory", May 1956. *U.S. Atomic Engery Commission,* TID-7526 (Pt. 1), p. 34-53.

The high-temperature rupture life of beryllium is extended considerably when small percentages of either oxide or carbide particles are well dispersed throughout the metal. Correlations are shown between stress-rupture results and microstructure and particle content. In the carbide group of alloys, some stress-rupture properties are plotted as a function of carbon content. 6 ref. (Q3m, 3-21; Be, SGA-h)

386-Q. Mechanical Properties of Reactor Grade Beryllium at Elevated Temperatures. R. G. O'Rourke, J. N. Hurd, K. G. Wikle and W. W. Beaver. Brush Beryllium Co. *U.S. Atomic Energy Commission,* COO-312, Aug. 1956, 142 p.

Mechanical properties of vacuum hot-pressed reactor-grade beryllium are summarized. This study covered the temperature range from 800 to 1500° F. and strain rates from 0.001 to 0.1 in. per in./per min. Addition of beryllium oxide to a level of 3% increases the mechanical strength of beryllium and improves stress-rupture and creep properties. At a total of 3% beryllium oxide, the equicohesive temperature of beryllium is increased about 200° F. over that expected for reactor-grade, beryllium containing 1% beryllium oxide. 19 ref.
(Q general, 2-12, Be)

387-Q. Microscopic Observations of High Purity Uranium Subjected to Thermal Cycling. R. M. Mayfield and L. T. Lloyd. Argonne National Laboratory. *U.S. Atomic Energy Commission,* ANL-5347, Sept. 15, 1956, 65 p.

Observations of the microstructural changes and deformation mechanisms which occur in coarse and fine-grained high-purity uranium as a result of heat treatments between room temperature and 500° C. indicate that thermal cycling growth embodies some of the features which have been observed in creep studies of aluminum. Coarse-grained specimens deformed by slip and twinning within the grains, as well as by grain boundary deformation.
(Q24; U)

388-Q. Microhardness Evaluation of Alpha Hot Rolled Uranium Rod for Drawing. M. T. McGown, H. S. Rubenstein and R. M. Treco. Paper from "Tenth Metallography Group Meeting". *U.S. Atomic Energy Commission,* TID-7523 (Pt. 1), Dec. 1956, p. 35-36.

A detailed microhardness investigation of hot rolled uranium rod before and after beta-treatment and drawing revealed the presence of nonuniform hardening throughout the cross-section. This investigation included compiling data to show radial and angular variations in hardness which might have been

introduced during processing.
(Q29q, U, 4-5)

389-Q. Microstructure of Some Irradiated Nonfissionable Metals. C. A. Bruch and W. E. McHugh. Paper from "Tenth Metallographic Group Meeting". *U.S. Atomic Energy Commission*, TID-7523 (Pt. 1), Dec. 1956, p. 81-89.

Determination of neutron irradiation effect on some mechanical and physical properties of metals such as copper, nickel, iron, molybdenum, zirconium, and titanium.
(Q general, P general, 2-17; Cu, Ni, Fe, Mo, Zr, Ti)

390-Q. On the Mechanical Metallurgy of Zircaloy-3b. D. E. Johnson. Paper from "Metallurgical Information Meeting, Ames Laboratory", May 1956. *U.S. Atomic Energy Commission*, TID-7566 (Pt.1), Feb. 1957, p. 54-68.

Tensile test properties in the rolling direction were determined for Zircaloy-3b. Tensile tests were performed with specimens in the annealed condition and in several cold worked conditions at testing temperatures of −50, 22, 100, 200 and 300° C. (Q27a, 1-4; Zr)

391-Q. Mechanical Properties and Corrosion Behavior of Zircaloy-3. F. Forscher, S. Kass and K. Goldman. Paper from "Metallurgical Information Meeting, Ames Laboratory", May 1956, *U.S. Atomic Energy Commission*, TID-7526 (Pt. 1), Feb. 1957, p. 69-88.

Mechanical properties and corrosion behavior of four zirconium alloys, Zircaloys 2, 3A, 3B and 3C, compared. Strength and ductility properties are compared at several temperatures in several heat treatment conditions in the transverse and longitudinal directions. Compression, impact and hardness test results are also reported. 6 ref. (Q general, R general, 2-11, 2-14; Zr)

392-Q. Effects of Interstitial Contaminants on the Notch-Tensile Properties of Titanium and Titanium Alloys—II. Alloy Titanium. E. P. Klier and N. J. Feola. U.S. Air Force. Wright Air Development Center. Technical Report 55-325, *U.S. Office of Technical Services*, PB 121575, Aug. 1956, 202 p. (CMA)

Six titanium alloys were studied for changes in the notch-tensile properties affected by the interstitial contaminants carbon, oxygen and nitrogen. Notch sensitivity depends on tensile strength and becomes potentially severe as the strength exceeds 150,000 psi. Alloy content and microstructure also have great effect. The other variables considered are test temperature, level of contamination and strain rate. (Q27d, 3-19; Ti)

393-Q. Effect of Plastic Fatigue on Pressure-Vessel Materials and Design. L. F. Kooistra. *Welding Journal*, v. 36, Mar. 1957, p. 120s-130s.

Correlation of data to establish the parameters governing pressure-vessel design with respect to the plastic fatigue characteristics of the material. Testing methods have been evaluated for determining "plastic endurance" as a characteristic of the material itself, as well as methods for establishing the "effective strain concentration factor" of various plate surface conditions, notches, attachments and the effects of welding. 15 ref.
(Q7a, Q24h, T26q)

394-Q. (English.) **Internal Friction and Critical Stress of Copper Alloys.** Shuichiro Takahashi. *Physical Society of Japan, Journal*, v. 11, Dec. 1956, p. 1956-1261.

The effects of strain amplitude on the internal friction and the Young's modulus of polycrystalline specimens of copper alloys (copper-zinc, copper-aluminum, copper-phosphorus) with various concentrations of solute atoms. 10 ref.
(Q22, Q21a, 3-16; Cu, *Zn, Al, P*)

395-Q. (English.) **Improvement of Copper Alloy Springs—I. Effects of Various Third Elements Added to Plain 60-40 Brass.** Masaynki Kawasaki and Osamu Izumi. *Tohoku University, Science Reports of the Research Institutes*, v. 8A, Dec. 1956, p. 484-492.

To improve the spring properties of plain 60-40 brass, iron, aluminum, manganese, nickel, cadmium and tin were added to the alloy; the alloys of copper-manganese-nickel and copper-iron series were examined.
(Q5g, 2-10; Cu-n, SGA-b)

396-Q. (English.) **Improvement of Copper Alloy Springs—II. 60-40 Brass Series Containing Iron, Manganese and Tin.** Osamu Izumi and Masayuki Kawasaki. *Tohoku University, Science Reports of the Research Institutes*, v. 8A, Dec. 1956, p. 493-501.

Effects of the respective elements on spring properties and bending characteristics of 60-40 brass sheet compared with each other. Present

results showed that manganese and tin would be the most favorable elements for practical purposes.
(Q5g; Cu-n, 2-10, SGA-b)

397-Q. (German.) **Creep of Aluminum Wires and Ropes.** S. Wintergerst and M. Aepfelbacher. *Aluminium,* v. 33, Jan. 1957, p. 16-23.

Creep tests on 99.5 aluminum wires and ropes under constant tension provide information about the dependence of creep in the elastic range and beyond on the stress. The effect of temperature variation between −6 and +66° C. The dependence of creep on structure and grain size of annealed wires and single crystals. 12 ref.
(Q3, 2-11, 3-21; Al, 4-11)

398-Q. (Italian.) **On the Formation of Chips.** Giuseppe Carro Cao. *Ingegneria Meccanica,* v. 5, Aug. 1956, p. 40-44.

Experimental confirmation of theory of plasticity as applied to problem of wedge penetrating a semi-infinite mass. Micrographic tests on continuous chip obtained from plastic material and cracked chip obtained from brittle material. (Q24)

399-Q. (Italian.) **Theoretical and Technical Study of Plastic Flexure. Parts III and IV. Practical Results of the Theory.** *Ingegneria Meccanica,* v. 5, June 1956, p. 51-64.

Deals with sheet metal in general, mild steel in particular. This section deals with variations in thickness, initial position of central fiber and development of break under traction, shape of deformed material, moment and angle of bending, numerical values, effects of variations in length, progressivity of phenomena of plastic flexure. 8 ref.
(Q24, Q5g; CN, 4-3)

400-Q. (Japanese.) **Fatigue Rupture of Metals.** Masa Ishibashi. *Japan Society of Mechanical Engineers, Journal,* v. 60, Jan. 1957, p. 15-19.

Description of tensile test, slip rupture, fatigue process and fretting corrosion of light alloys. 83 ref.
(Q7a, Q27, R1f; EG-a39)

401-Q. (Spanish.) **Variation of the Properties of Spring Steels as Determined by Heat Treatment and Surface Finish.** Mario Pujol Roig. From "Papers Presented at 3rd General Assembly of the Iron and Steel Institute". 1956. 16 p.

First part is brief study of springs and spring steels, including characteristics, proper heat treatment, importance of surface condition and most common spring failures. Second part deals with experimental study of carbon spring steel. Gives characteristics of the steel, description of tests and results of various heat treatments, both conventional and isothermal, and of surface treatments; special attention to behavior under fatigue tests. Shows that treatment producing bainite is most favorable to fatigue life and that polishing and phosphating are more advisable than sandblasting. 11 ref.
(Q7a, 2-14; ST, SGA-b)

402-Q. Motion Pictures of Metal Fatigue. *ASTM Bulletin,* No. 220, Feb. 1957, p. 20.

Fatigue-testing machine equipped with a clock-controlled, 16-mm. camera to take time-lapse motion pictures of aluminum specimens under torsional stress has been constructed by National Bureau of Standards. (Q7, 1-3, X5; Al)

403-Q. New Method for Recording Explosion Impulse Effects on Solids. W. E. Bron, K. A. Zadwick and A. L. Tarr. *ASTM Bulletin,* No. 220, Feb. 1957, p. 50-51.

Method for measuring properties of elastic waves as propagated in metals and generated by explosives or other means, using strain gages, amplifiers and an oscilloscope for recording. Useful in experimenting with brittle failures. (Q21, 1-4)

404-Q. Stability of Mechanical Properties of Beta-Phase Magnesium-Lithium Alloys. W. R. D. Jones and G. V. Hogg. *Institute of Metals Journal,* v. 24, Feb. 1957, p. 255-261.

Attempts to decrease instability of mechanical properties by addition of varying amounts of silver, copper, cadmium, aluminum, tin, antimony or nickel to three basic beta-phase magnesium-lithium ternary alloys containing cadmium or zinc. Hardness, microscopic and X-ray diffraction studies suggested instability of mechanical properties is connected with electron concentration. Information on phase changes during aging. (Q general, N7a, 2-10; Mg, *Li*)

405-Q. Mechanical Properties of Flake Graphite Cast Irons. G. N. J. Gilbert. *Iron and Steel,* v. 30, Mar. 1957, p. 103-106.

Review of literature dealing with relationship of ratio of tensile

strength to Brinell hardness with eutectic cell size and graphite type and size. Relationship between the tensile strength, hardness and modulus of elasticity and variation in effective cross section size with these. (Q27a, Q29n, Q21a, CI)

406-Q. Improving Hot Ductility of 310 Stainless. R. A. Perkins and W. O. Binder. *Journal of Metals,* v. 9, Feb. 1957, p. 239-245.

Factors which promote hot cracking tendencies. Effects of eight deoxidizing additions. Results cannot be applied directly to commercial practice; the observations should have general significance and applicability to the behavior of hot worked metal. 13 ref.
(Q23p, 2-12; SS)

407-Q. Formation of Cracks in Soederberg Electrodes Used in Aluminum Reduction Plants. Ove Sandberg, Leif Olsen and Torgrim Eftestoel. *Journal of Metals,* v. 9, Feb. 1957, p. 261-266.

Research work performed to determine relationships between crack formation and shrinkage, method for measurement of shrinkage, raw material quality and paste composition as related to shrinkage phenomena. (Q26, W18, 17-7; Al)

408-Q. An Investigation of the Structural Conditions in Steel Bearing-Balls. I. Berz and C. Wainwright. *Metallurgia,* v. 55, Mar. 1957, p. 121-124.

Three nondestructive tests used for balls were tests for strength by rapidly rotating magnetic field, high-frequency electrical test and X-ray diffraction examination. Polar areas determined by X-ray examination were related to residual flow line markings of etched sections. Correlations found between X-ray results and measurements by high-frequency method.
(Q27, 1-4; ST, SGA-c)

409-Q. Zinc-Aluminum-Copper Bearing Metal. Properties of Alzen 305 Alloy. *Metallurgia,* v. 55, Mar. 1957, p. 133-134.

Mechanical, seizure, wearing and casting properties of Alzen 305 and comparison to traditional phosphor bronzes.
(Q general, Q9n, E25p, *Zn*. Al, Cu, SGA-c)

410-Q. Assessment of the Drawing and Forming Qualities of Sheet Metal by the Swift Cup-Forming Test. O. H. Kemmis. *Sheet Metal Industries,* v. 34, Mar. 1957, p. 203-208.

Reasons for use of tests. Test development. Investigation on the correlation of the test with pressing performance of sheet steel. Proposals for standardizing testing procedures. Information on test pieces, equipment and method. (To be concluded.) (Q23q, 1-4; ST, 4-3)

411-Q. Survey of Low-Alloy Aircraft Steels Heat Treated to High Strength Levels. (Pt. 3). Failure Causes. G. Sachs. Syracuse University (Wright Air Development Center). *U.S. Office of Technical Services,* PB 121667, July 1954, 80 p. $2.00.

Failure in high-strength steel aircraft parts stems from a number of different sources, it was concluded from data gained from descriptions of actual failures and analyses of conditions and sources of failures; in addition, failure usually resulted from a combination of several factors which deviated from those encountered in regular manufacture, rather than from a single factor.
(Q general, T24; AY-n)

412-Q. New High Temperature Intermetallic Materials. (Pt. 4). Ronald Silverman. American Electro Metal Corp. (Wright Air Development Center). *U.S. Office of Technical Services,* PB 121232, Mar. 1956, 49 p. $1.25.

Excellent high-temperature creep resistance, but low impact resistance, is reported for Alloy 223 (chromium-molybdenum-silicon, 81-16-3). Materials with appreciable amounts of sigma in the cobalt-chromium-molybdenum system proved unsuitable for jet turbine blading. Alloys in the nickel-zirconium binary system showed promising oxidation resistance and ductility.
(Q3m, Q6n; Cr, *Mo, Si,* 14-18, SGA-h)

413-Q. Creep Buckling of Integrally Stiffened Aluminum Alloy Panels. C. W. King. North American Aviation, Inc. (Wright Air Development Center). *U.S. Office of Technical Services,* PB 121466, May 1956, 70 p. $1.75.

The tests were conducted at constant bending moment and temperature and uninterrupted time until failure; time ranged from fractional hours to 200 hr.; results were shown compared to a temperature-time parameter previously proposed for tensile creep properties to indicate the similarities in stress-tempera-

ture-lifetime relationships for the different basic mechanisms of failure. (Q3c; Al)

414-Q. Research on Elevated Temperature Resistant Ceramic Structural Adhesives. R. M. Spriggs, H. G. Lefort and D. G. Bennett. University of Illinois (Wright Air Development Center). *U.S. Office of Technical Services,* PB 121659, Sept. 1956, 99 p. $2.50.

Ceramic structural adhesives were evaluated as bonding materials for stainless steel subjected to the high-temperatures characteristic of jet engines. Adhesives tested were ceramic-oxide, glassy bond coatings, cermets with sintered metal bonds, and air-setting, temperature-resistant silicates. Results were based primarily on shear strength tests at room temperature and from 600 to 1000° F. An adhesive of the ceramic oxide, glassy-bond type gave best results when used with 28 mesh stainless steel as a carrier.
(Q2g, 2-12; NM-f, NM-d34, SS)

415-Q. Slip Damping of Press-Fit Joints Under Linearly Varying Pressure. J. H. Klump and L. E. Goodman. University of Minnesota. (Wright Air Development Center). *U.S. Office of Technical Services,* PB 121760, Sept. 1956, 47 p. $1.25.

Develops expressions for the damping and elastic properties of joints under a linearly varying clamping pressure. The predictions of the theory are compared with the results of controlled experiments. Correlation is made between the linear pressure joint and a uniform pressure joint which was investigated previously. (Q8, Q21; 7-6)

416-Q. Creep, Fracture, and Bending of Lead and Lead Alloy Cable Sheathing. Curtis W. Dollins and Cecil E. Betzer. *University of Illinois Bulletin,* v. 54, Nov. 1956, 44 p.

Tests covered principally long-time creep under steady tensile stresses up to 300 psi. at 110 and 150° F., time to fracture and ductility under steady tensile stresses of 400 to 1800 psi. at room temperature and 110° F., and life to fracture in slow bending to strains of 0.3 to 0.5%. 14 ref. (Q3m, Q27a, Q5g; Pb)

417-Q. Torsional Properties of Steels at High Rates of Strain. Paul G. Jones and Thomas J. Dolan. *University of Illinois Bulletin,* v. 54, Feb. 1957, 23 p.

Determination of the effects of strain rate, temperature, type of notch and size of specimen on four steels tested in torsion. Unnotched specimens were ¼ in. in diameter and the root diameters of notched specimens were 3/16 in. and 3/8 in. Two sharpnesses of notch were used giving ratios of notch radius to root diameter r/D, of 0.160 and 0.053. Three rates of torsional strain were obtained by using angular velocities of 0.5 rpm., 27 rpm. and 1300 rpm. for the flywheel which loaded the specimen. The tests were conducted at −100° F., room temperature, and 700° F. 23 ref. (Q1a, 1-4; ST)

418-Q. (French.) **Characteristics of the Design of Light Alloy Structures. (Pt. 2).** Jean Reinhold and Henri Hugonnet. *Revue de l'Aluminium,* no. 235, Sept. 1956, p. 841-848.

Mechanical principles underlying aluminum structural design such as shearing stress, critical buckling stress, failing stress, torsion, shape factors, frequency of vibration. Discusses the problems involved. (Concluded.) (Q general; Al, SGB-s)

419-Q. (French.) **Riv-Clé Rivets and the Assembly of Sheets Accessible From Only One Side. (Pt. 3).** B. Adaridi. *Revue de l'Aluminium,* no. 236, Oct. 1956, p. 963-967.

Tests carried out on open flat-head Riv-Clé rivets to determine mechanical properties such as the average setting effort, shearing stress and the axial tension stress under which the head is torn off. The choice of the metal is discussed according to the material used for the rivets: mild steel, brass with 35% zinc, or light alloy of the A-SG class.
(Q27, Q2, K13n; CN, Cu-n, Al)

420-Q. (German.) **Investigations of Aluminum Magnesium Casting Alloys.** M. Kato and Y. Nakamura. *Aluminium,* v. 33, Mar. 1957, p. 152-162.

Good mechanical properties and corrosion resistance of aluminum-magnesium alloys. Study of the reaction of the melt with graphite, steel and cast iron of crucibles and with wet and dry sand molds. Influence of alloying elements and impurities on physical properties. Mitigation of detrimental effect of silicon and iron by addition of manganese. 12 ref.
(Q general, R general, E25; Al, *Mg*)

421-Q. (German.) **Statistical Comparison of Notch Toughness Values as Measured on Two Different Pendulum Impact Testing Machines.** Alexander Schepers and Frenz Rudolf Licht. *Stahl und Eisen,* v. 77, Feb. 21, 1957, p. 218-221.

Testing results on DVM-test bars cut from normalized plain steels Type C15 with 0.15% C and C60 with 0.62% C. Determination of the notch toughness on two different pendulum impact testing machines with a maximum strength of blow of 15 and 30 kgm. Investigation of the reliability of the differences found by statistical methods and their interpretation. 2 ref.
(Q6r; CN)

422-Q. (German.) **Mechanical Properties of Weld Joints on Steels Used in the Construction of Boilers and Containers, as Dependent on the Heat Treatment.** Werner Hummitzsch. *Stahl und Eisen,* v. 77, Mar. 7, 1957, p. 279-290.

Mechanical properties of weld joints made by using different electrodes on boiler plates according to DIN 17-155 in the cold or hot worked conditions as well as in the undeformed condition after normalizing or stress relieving; similar investigations on special steels used in the construction of high-pressure containers and pipe-lines, as dependent on the cooling rate after welding; contents, partial pressures and equilibrium temperatures of hydrogen in the weld metal deposited by electrodes with acid ore or rutile coats or with a basic lime coat; effect of the hydrogen on the formation of cold cracks and fish-eyes during the tensile test and their suppression by using a special heat treatment of the weld seams.
(Q general, W29, ST, 7-1)

423-Q. (Book.) **Elevated Temperature Properties of Coppers and Copper-Base Alloys.** Fred F. Van Atta. American Society for Testing Materials, ASTM Special Technical Publication STP 181, Aug. 22, 1956, 248 p. $5.50.

A graphical summary of the elevated temperature data for coppers and copper-base alloys. Data for the coppers are limited to the wrought materials, while the data for the alloys apply to cast and wrought materials. Graphical data includes modulus of elasticity, tensile strength, yield strength (0.5% extension and 0.2% offset) reduction of area, elongation, stress for creep rates of 0.000001, 0.00001, and 0.0001% per hr. and stresses for rupture in 100, 1000, 10,000, and 100,000 hr.
(Q21a, Q27a, Q3m, 2-12; Cu)

424-Q. Non-Propagating Cracks in Vee-Notched Specimens Subject to Fatigue Loading. N. E. Frost. *Aeronautical Quarterly,* v. 8, Feb. 1957, p. 1-20.

Reversed direct stress and rotating bending fatigue tests have been carried out on Vee-notched specimens of aluminum alloy, nickel chromium steel and mild steel. Diagrams are presented showing the relationship between the geometric stress concentration factor and the strength reduction factor. 18 ref.
(Q7c, Q7d; Al, Ni, CN, AY, *Cr*)

425-Q. How Does 200 Series Stainless Steel Fit in Shop Production Picture? Richard E. Paret. *Artisan,* Mar. 1957, p. 66-69.

Laboratory and time tests on specialty items and parts show that Types 201 and 202 stainless steel are satisfactory replacements for their higher nickel counterparts in the 300 series and need cause no revision in shop techniques or schedules. (Q general, 17-2; SS)

426-Q. Metallurgy of Ductility; a New Law. J. Ryan. *Australasian Engineer,* no. 44, Jan. 7, 1957, p. 48-52.

Effects of hydrostatic pressures on various flow and the fracture characteristics. Any measure of plasticity is only valid for a stipulated pressure. (Q23p, 3-24)

427-Q. Arrest of Brittle Cracks in Ship Plate. J. Hunter. *Australasian Engineer,* no. 45, Feb. 7, 1957, p. 52-58.

A series of tests indicates the possibility of arresting low-temperature brittle cracks in ship plates by introducing a narrow strip of austenitic stainless steel, or in some applications, by a transverse butt weld of austenitic stainless steel.
(Q26s; ST, SS)

428-Q. Effects of Cyclic Stress and Frequency on Deformation Markings in Fatigued Copper. D. S. Kemsley. *Australian Aeronautical Research Laboratories,* Report A.R.L./Met 17, 15 p.

Fractured rotating-cantilever specimens tested at stresses ranging from 10,000 to 25,000 psi. and frequencies of 21 and 6000 cycles per min. were sectioned and examined after polishing and etching by optical electron microscopy. An explanation of the main observation is given in terms of interaction

between dislocations. 15 ref. (Q7c, M26b, M21e; Cu)

429-Q. Factors Affecting the Mechanical Properties of Pearlitic Nodular Irons. G. N. J. Gilbert. *British Cast Iron Research Association Journal,* v. 6, Feb. 1957, p. 484-497.

Test relationship of chemical composition and microstructure to ductile to brittle transition temperature and the relationship of transition temperature to tensile strength and elongation of pearlitic nodular iron; discusses decrease of transition temperature upon normalizing and relation to strength and elongation; influence of trace elements on strength of basically similar pearlitic irons. (Q23r, 2-10, 3-21; CI-r)

430-Q. Tensile and Fatigue Tests on Normalized Pearlitic Nodular Irons. G. N. J. Gilbert and K. B. Palmer. *British Cast Iron Research Association Journal,* v. 6, Feb. 1957, p. 498-504.

Compares microstructure, tensile strength, elongation, proof stress, hardness and fatigue properties of as-cast and normalized pearlitic nodular irons with silicon contents varying between 1.63 and 2.56%; influence on properties of normalizing temperature and rate of air cooling. (Q general, 2-14; CI-r)

431-Q. Fatigue of Cast Iron. H. Morrogh. *Foundry Trade Journal,* v. 102, Feb. 14, 1957, p. 197-202.

Review of the various cast irons available and methods for the preparation of test pieces. Fatigue properties and stress raisers for flake graphite, malleable and nodular-graphite cast irons are considered in addition to the effects of under and over-stressing in fatigue tests. 28 ref. (Q7a; CI)

432-Q. Fatigue of Cast Iron. H. Morrogh. *Foundry Trade Journal,* v. 102, Feb. 21, 1957, p. 239-244.

Concluding section of literature review deals with effect of surface rolling on fatigue properties of nodular and flake-graphite cast irons of ferritic and pearlitic types. Effects of tension and compression stresses, elevated and subzero temperatures, surface finish and heat treatment on fatigue properties. 30 ref. (Q7a, 3-20; CI)

433-Q. Metallurgy of Cutting Tools. Pt. III—Toughness and Wear Resistance. K. G. Lewis. *Iron and Coal Trades Review,* v. 174, Feb. 22, 1957, p. 453-457.

Discussion of the toughness or resistance of the cutting edge to breakage and chipping. Study of resistance of the tool material to wear or abrasion, review of some of the theories put forward to account for crater wear and for the increased tool life achieved by incorporation of such materials as titanium carbide. 86 ref. (Q9n, T6n)

434-Q. Steady State Creep Through Dislocation Climb. J. Weertman. *Journal of Applied Physics,* v. 28, Mar. 1957, p. 362-364.

A dislocation climb creep model which does not require the production of immobile dislocations is considered. Creep rate is expressed as a function of stress and activation energy. 13 ref. (Q3n, M26b)

435-Q. Metallurgy of Cutting Tools. Pt. IV—Some Theories on the Mechanism of Wear. K. G. Lewis. *Iron and Coal Trades Review,* v. 174, Mar. 1, 1957, p. 503-509.

Review of theories dealing with mechanism of crater wear and with effect on tool life of the incorporation of such materials as titanium carbide. (Q9n, T6n)

436-Q. Theoretical Criterion for the Fracture of Metals Under Combined Alternating Stresses. Takeo Yokobori. *Journal of Applied Mechanics,* v. 24, Mar. 1957, p. 77-80.

Criterion is developed on the basis of the present concepts of dislocations. These concepts are modified by taking into account the stress concentration by the inclusion itself against which dislocations pile up. 15 ref. (Q26r)

437-Q. Experimental Investigation of the Deformed Zone Associated With Indentation Hardness Impressions. L. E. Samuels and T. O. Mulhearn. *Journal of the Mechanics and Physics of Solids,* v. 5, Mar. 1957, p. 125-134.

Using a metallographic method and specimens of 70:30 brass, experimental determinations were made of the elastic-plastic and other low-strain boundaries of the deformed zone associated with indentation hardness impressions. 16 ref. (Q29b, Q24, 1-4; Cu-n)

438-Q. Application Factors for Titanium. *Machine Design,* v. 29, no. 6, Mar. 21, 1957, p. 167-170, 172. (CMA)

Advantages of titanium in designs where it is suitable, namely: weight reduction, stiffness-to-weight ratio, fatigue resistance, strength-to-weight ratio, hot tensile properties, cold creep resistance and corrosion resistance. Welding and forming

properties are briefly considered. (Q general, T general, 17-1; Ti)

439-Q. Temper Brittleness. *Mechanical World and Engineering Record,* Mar. 1957, p. 135-137.

Significance and character of temper brittleness; influence of alloys; possible remedies; difference from another condition known as blue-brittleness. (Q26s)

440-Q. Titanium Research and Development—Pt. I. N. P. Inglis. *Metal Industry,* v. 90, Mar. 8, 1957, p. 185-188, 194. (CMA)

The properties of ICI-developed alloys discussed. 314A and 318A are alpha-beta type alloys which can be heat treated to high strengths by quenching from the alpha-beta field. Fatigue tests, still in progress, show that the fatigue strength of titanium alloys approaches that of steel. Notch tests under reversed bending and reversed direct stresses showed notch sensitivity is greater with the latter. 371 (α) has the best creep properties. Difficulties in sheet-forming titanium alloys are considered; a "soft" alloy is sought which can be much hardened by heat treatment. U.S. experiences in sheet rolling are cited.
(Q general; Ti)

441-Q. Titanium Research and Development—Pt. II. N. P. Inglis. *Metal Industry,* v. 90, Mar. 15, 1957, p. 205-206. (CMA)

Work at the Fulmer Research Institute on the hydrogen embrittlement of 314A is cited; properties were unaffected up to 330 ppm. and 300° C. It is noted that no structural change has been discovered in hydrogen-embrittled alpha-beta titanium alloy. The alloys 120, 130, 317 and 371 have been satisfactorily joined by several welding methods. Consumable arc welding requires more stringent precautions than does tungsten arc welding. The fabrication of tubing and extrusions is discussed. (Q26s, K1g; Ti, 4-8, 4-10)

442-Q. Nuclear Engineering: a Device for Tensile Tests of Irradiated Metals. R. E. Hueschen and D. C. Kaulitz. *Nucleonics,* v. 15, Mar. 1957, p. 88-92.

An apparatus that permits tensile testing of highly radioactive specimens at temperatures up to 800° C. It contains an optical unit capable of observing specimen strain through shielding windows. This unit can measure elongations up to 50% with a 1-in. long sample. (Q27, 1-3, 2-17)

443-Q. New High Temperature Intermetallic Materials. Pt. 3. William Arbiter. American Electro Metal Corp. (Wright Development Center). *U.S. Office of Technical Services,* PB 121019, Dec. 1954, 98 p. $2.50.

Average properties of a large number of compositions in the chromium-titanium-oxygen-nitrogen systems. In both systems nitrogen additions increased brittleness while increasing high-temperature strength. Silicide compositions tested showed brittle behavior and attempts to modify this by the addition of metallic binders resulted in little, if any, improvement. (Q26s, Q27a, 2-12)

444-Q. Selection of Materials for High-Temperature Applications in Airframes: Supplement. S. A. Gordon and L. R. Jackson. Battelle Memorial Institute (Wright Development Center). *U.S. Office of Technical Services,* PB 121602, Feb. 1956, 30 p.

General information for design of airframes was derived from crippling tests on channel and angle sections on C-110 M titanium alloy at temperatures to 800° F. Results were used to calculate the structural index which was compared with the theoretical structural index through data from the compressive stress-strain curves of the materials involved.
(Q28g, T24a, 17-1, 2-12; SGA-h)

445-Q. Effects of Specimen Preparation on Fatigue. F. H. Vitovec and H. F. Binder. University of Minnesota. (Wright Development Center). *U.S. Office of Technical Services.* PB 121576, Aug. 1956, 53 p. $1.50.

Investigation of the penetration of plastic deformation caused by the notch preparation. Data are reported on the effect of lapping procedure on the Prot failure stress of SAE B1113 steel and SAE 1020 steel. (Q7, 1-10; CN)

446-Q. Fatigue, Creep, and Rupture Properties of Heat Resistant Materials. F. H. Vitovec and B. J. Lazan. University of Minnesota. (Wright Development Center). *U.S. Office of Technical Services,* PB 121580, Aug. 1956, 213 p.

The heat resistant alloys Stellite 31, S-816, 6.3% Mo Waspalloy, 7% Mo Waspalloy, M-252, Inconel X-550, 16-25-6 Timken, Crucible 422,

Lapelloy and Stainless Type 403 were studied at temperatures up to 1650° F. under various combinations of alternating and mean stress. Notched and unnotched specimens were used. (Q7a, Q3m; SGA-h)

447-Q. Investigation of the Compressive, Bearing, and Shear Creep-Rupture Properties of Aircraft Structural Metals and Joints at Elevated Temperatures. F. J. Vawter. Cornell Aeronautical Laboratory, Inc. (Wright Development Center). *U.S. Office of Technical Services, PB* 121656, Sept. 1956, 95 p. $2.50.

High-temperature creep data on aircraft sheet, plate and rivet structural alloys under the influence of shear, bearing and compressive stresses.
(Q3m, Q28g, Q2g, T24; SGB-s)

448-Q. (French.) **Measurement of the Modulus of Rigidity of Sintered Alumina up to 1000° C.** Christiane Susse. *Comptes Rendus,* v. 245, Jan. 14, 1957, p. 302-305.

Sample investigated was of 99.5% pure alumina, the impurities contained being silica, sodium hydroxide and potassium hydroxide, together with traces of vanadium and magnesium. It was sintered at 1900° C. Microscopic observation; modulus of rigidity as a function of temperature; discussion of results.
(Q21, 1-11; Al, 6-22)

449-Q. (French.) **Study of Tungsten Carbide Tool Wear by Means of Radioactive Tracers.** H. Creuzot and P. Leveque. *Revue Générale de Mecanique,* v. 41, Jan. 1957, p. 1-5.

New method for investigating wear of cutting tools renders the tool radioactive and studies the emissivity of the shavings; factors in the choice of tracer elements; activation; methods of testing; calculation of results. Permits comparision of results with the gravimetric method. (To be continued.)
(Q9n, 1-4, 14-13; W, 6-19)

450-Q. (German.) **Permanent Deformation of Helical Springs.** U. Otzen. *Draht,* v. 8, Feb. 1957, p. 49-54.

Influence of tensile strength, yield, strength, elongation, constriction and the twisting factor. Importance for the manufacture of helical springs. (Q23b, Q27a, Q1a, T7c)

451-Q. (German.) **Stress Analysis. Pt. I.** K. Matthaes. *Metall,* v. 11, Feb. 1957, p. 99-104.

Discussion of tensile strength from the mathematical, physical and chemical viewpoints. Description of the elastic properties. 14 ref.
(Q25, Q27a)

452-Q. (German.) **Contribution to the Deformation of Copper-Zinc Alloys, Especially of Beta-Brass.** E. Pelzel. *Metall,* v. 11, Feb. 1957, p. 123-127.

Two components determine the physical properties of binary copper-zinc alloys: (*a*) the alpha-solid solution in the concentration region between pure copper and copper with 40% zinc, and (*b*) the beta-solid solution with a zinc content of 46-50%. Investigation of the correlation between deformation forces, composition and temperature. 4 ref.
(Q24, M27b; Cu-n)

453-Q. (German.) **Work Hardening of Round Steel Wire When Using Different Methods of Shaping. Pt. II. Influence of a Preliminary Deformation by Drawing on the Strength Obtained in Subsequent Flat Rolling.** Winfred Dahl and Werner Lueg. *Stahl und Eisen,* v. 77, Mar. 21, 1957, p. 334-340.

Review of the literature; determination of the tensile strength in flat rolling and pressing of predrawn round wire containing 0.03 and 0.45% C.; comparison with previous results. (Q24; ST, 4-11)

454-Q. (German.) **Effect of Different Conditions of Temper Rolling and Aging on the Yield Point of Deep-Drawing Strip Steels.** Fritz Fisher, Matthias Nacken and Vincenz Seul. *Stahl und Eisen,* v. 77, Mar. 1957, p. 340-346.

Effect of aging under different conditions of temper rolling; interpretation of the test results with the aid of the dislocation theory.
(Q23b, F23r, 2-15; ST, 4-3)

455-Q. (Russian.) **Normal Elasticity Modulus of Zirconium-Columbium Alloys.** Yu. F. Bychkov, A. N. Rozanov and D. M. Skorov. *Atomnaya Energiya,* v. 2, Feb. 1957, p. 152-156. (CMA)

The normal elasticity modulus (Young's modulus) of zirconium-columbium alloys (0-100% Cb) was measured at temperatures up to 950° C. and at room temperature for various thermal treatments. 4 ref. (Q21a, 1-11; Zr, Cb)

456-Q. Hydrogen Contents of Mild and Alloy Steel Weld Deposits With Some Reference to the Effects of Hydrogen Embrittlement in Welded Joints. P. D. Blake. *British Weld-*

ing Journal, v. 4, Mar. 1957, p. 146-154.

Records experimentally determined hydrogen contents of variety of weld deposits. Data on effect of drying electrodes immediately before use and the evolution of hydrogen from weld metal at progressively higher temperatures; discusses question of hydrogen embrittlement and puts forward theory of four possible mechanisms which can apply. 25 ref. (Q26s; AY, *H,* 7-1)

457-Q. Tensile Strength of Light Steel. E. W. Williams. *Canadian Mining and Metallurgical Bulletin,* v. 50, Mar. 1957, p. 147-153. (*Transactions,* v. 60, 1957, p. 89-95.)

Experimental study of tensile properties of controlled density steel produced by sintering iron oxide powder in presence of coke. Results of microscopic examination and mechanical testing of test specimens varied in density, carbon content, cooling rate, chromium, manganese, nickel, molybdenum, copper, cobalt or phosphorus content. (Q27a, 2-10; ST)

458-Q. Suitability of Indian Pig Irons for the Production of Nodular Cast Irons. P. K. Gupte, M. N. Parthasarathi and B. R. Nijhawan. *Indian Institute of Metals, Transactions,* v. 8, 1954-55, p. 129-164.

A series of experiments carried out to determine the maximum percentage of phosphorus permissible without deterioration in the mechanical properties of the nodular iron. The relation between the various mechanical properties, such as tensile strength, ductility, etc., and the microstructure is discussed. The importance of the proper control of composition is brought out. Having determined the maximum phosphorus content, the various methods of reducing the phosphorus content in cast iron are discussed in the light of latest trends in foundry practice. (Q general, M27, E25q; CI-r)

459-Q. Damping Characteristics and Decay of Vibration Amplitude of Metals and Alloys From Energy Considerations. S. Ghosh, K. C. Som, A. K. Lahiri and G. P. Chatterjee. *Indian Institute of Metals, Transactions,* v. 8, 1954-55, p. 165-185.

A simple instrument has been constructed to measure the specific damping capacities of metals and alloys by the torsional oscillation method. It has been shown that vibration damping capacities of carbon and low-alloy steels reach a maximum and then sharply decrease with increasing performance values—the so-called P-values of steels. Quenched specimens of plain carbon steel show appreciable changes in damping capacity on low-temperature tempering even for short periods of time. (Q8g, 1-3; Cn, AY)

460-Q. Investigation on the Development of Low-Carbon Low-Alloy Case Hardening and High-Strength Steels With Electrolytic Manganese. S. Visvanathan, S. N. Anant Narayan and P. K. Chakravarty. *Indian Institute of Metals, Transactions,* v. 8, 1954-55, p. 187-216.

Possibility of utilizing electrolytic manganese for the production of two categories of low-carbon steel (viz., alloy case hardening steels and weldable high-tensile steels for replacing the commoner commercial grades which employ other alloy additions). For this purpose, a number of steel compositions were chosen and the properties of bars forged from experimental heats compared with those of standard grades. (Q general, 17-2; AY-n, *Mn,* AD-a)

461-Q. Effect of Ceramic Coatings on Creep of Alloys. J. R. Cuthill, J. C. Richmond and N. J. Tighe. *Industrial Heating,* v. 24, Mar. 1957, p. 582-588.

Ceramic coatings on 80-20 Ni-Cr alloys greatly reduced creep rate and void formation at high temperatures in tests at National Bureau of Standards. (Q3n; Ni, *Cr,* 8-21)

462-Q. High-Strength Zirconium Alloy: Zr-4 Wt-% Sn-1.6 Wt-% Mo. W. Chubb. *Journal of Metals,* v. 9, Apr. 1957, p. 461-468. (CMA)

Zr-4Sn-1.6Mo is heat treatable, readily rolled at 800° C. and has a creep strength at 500° C. which is four times that of zirconium. Cold reduction greater than 20% can be effected in the annealed condition. Tensile strength in the heat treated condition may exceed 140,000 psi. Air quenching hardens the alloy more than water quenching. (Q27a, Q3m, 1-12, J26; Zr)

463-Q. Effect of Small Amounts of Alloying Elements on the Ductility of Cast Molybdenum. L. E. Olds and G. W. P. Rengstorff. *Journal of Metals,* v. 9, Apr. 1957, p. 468-471. (CMA)

The effect on the ductility of cast

molybdenum was studied by adding 0.5-1.0% titanium, 10% thorium, 0.026% aluminum, 0.1% cerium, 0.5% vanadium and under 0.25% zirconium. They were effective in lowering the bend-angle transition temperature in the above order. The thorium addition causes hot shortness above 1500° F.
(Q23p, 2-10; Mo, 5)

464-Q. Hot Work Steels for Aircraft Structures. Edward A. Loria. *Materials and Methods,* v. 45, Mar. 1957, p. 115-119.

Data on short-time elevated-temperature tensile and yield properties, tensile stability at high temperatures and creep properties at elevated temperatures of three hot worked steels. (Q27a, Q3m, 1-12; TS)

465-Q. Steam Piping Materials for High Temperature Service. H. S. Blumberg. *Materials and Methods,* v. 45, Mar. 1957, p. 126-129.

Requirements of steels to be used as steam piping materials at high operating temperatures and pressures including working properties, strength and stability; characteristics of ferritic and austenitic stainless steels currently used and new alloys under development.
(Q23, 1-12; ST, 4-10)

466-Q. Metals for High-Speed Flight. Wolfgang H. Steurer. *Metal Progress,* v. 71, Apr. 1957, p. 66-73.

At very short periods of exposure to high temperatures in terms of minutes or seconds, many metallic materials show properties far superior to those obtained in conventional tests. Consequently, they can often admirably resist the transient heat conditions encountered in guided missiles and high-speed aircraft.
(Q27a, 2-12, 3-17; SGA-h, SGA-b)

467-Q. Embrittlement (?) of Phosphated Steel. Harold P. Weinberg and Thomas J. Capello. *Metal Progress,* v. 71, Apr. 1957, p. 78-81.

Embrittlement of chromium-nickel-molybdenum steel, F.S. 4340, heat treated to high strength, by phosphate coating of either zinc base or manganese base can be prevented by aging 24 hr. at room temperature or by baking 1 hr. at 220° F.
(Q26s, L14b; AY)

468-Q. Improved Ductility in Titanium Welds. M. L. Kohn, G. E. Faulkner and G. W. Bauer. *Metal Progress,* v. 71, Apr. 1957, p. 82-86.

The commercial alpha-beta alloy with 6% Al and 4% V has deficient bend ductility when welded with filler metal of the same composition, but much better when welded with unalloyed titanium as filler metal, especially after a long anneal in the alpha-beta phase region.
(Q5g, K9, 2-10; Ti)

469-Q. Fatigue Properties of Brasses, Bronzes and Bearing Metals. J. W. Cuthbertson. *Metal Treatment and Drop Forging,* v. 24, Mar. 1957, p. 89-92.

Surveys fatigue characteristics of various copper-base and bearing alloys; their applications and the mechanisms by which bearings fail through fatigue. (To be continued.)
(Q7a; Cu, SGA-c)

470-Q. Better Forgings — Proper Testing Is Essential for Improved Products. Ihor E. Suchoversky. *Steel Processing and Conversion,* v. 43, Mar. 1957, p. 127-134.

Since forgings lack the simplicity of products such as sheet and extrusions, the selection of representative mechanical testing locations constitutes a major problem. Discussion of the selection of testing locations in aluminum-alloy forgings and the effect of directionality on mechanical properties.
(Q general, 1-10, 1-4; Al, 4-1)

471-Q. Hidden Troublemakers; Residual Machining Stress. Erik K. Henriksen. *Tool Engineer,* v. 38, Apr. 1957, p. 92-96.

Origin of machining stresses and mechanism of stress formation from single-point tools. Variation of stress with rake angle, depth of cut, tool nose radius and material being cut. Stresses from milling cutters and from grinding. (Q25h, G17)

472-Q. Hot Malleability of Zircaloy-2 and High Zirconium-Uranium Alloys. R. E. Droegkamp. *U.S. Atomic Energy Commission,* WAPD-LSR (FE)-3, Feb. 5, 1955, 19 p. (CMA)

Specimens of zirconium-uranium alloys (50, 60, 70 and 80% zirconium) and Zircaloy-2 were hot compression tested at temperatures between 1000 and 1600° F. The edge-cracking of Zircaloy-2 indicates its poor malleability at certain temperatures, but malleability is good as low as 1500° F. The malleability of zirconium-uranium alloys extended down to 1000° F., where failure was of the shearing type. Data show that

greater reductions could be taken, resulting in more uniform flow and a greater yield.
(Q23q, Q28, 1-12; Zr, *U*)

473-Q. Properties of Zirconium and Its Alloys. Pt. I. Properties of Zirconium; Pt. II. Properties of Zircaloy-2; Pt. III. Experimental Alloys. P. J. Pankaskie. *U.S. Atomic Energy Commission,* NAA-SR-MEMO-1269, Mar. 11, 1955, 64 p. (CMA)

The mechanical, creep and fatigue properties of zirconium and Zircaloy-2 and the effect of gases thereon reviewed and discussed. Also covered are their coefficients of thermal expansion, thermodynamic values, and reactivity at high temperatures with the halogens, hydrogen, oxygen, nitrogen, carbon monoxide, carbon dioxide and air. Binary zirconium alloys are classified according to the eutectic, eutectoid and solubility effects. Graphs are presented for tensile and yield strength and elongation vs. addition (aluminum, chromium, copper, iron manganese, molybdenum, nickel, niobium, silicon, tin, tantalum, titanium, tungsten or vanadium). Experimental data for ternary alloys of zirconium compared with data on zirconium and stainless steel.
(Q general, P11g, P12, 1-10; Zr)

474-Q. Stress-Strain Characteristics of Uranium. David A. McCutchan and Glenn Murphy. Iowa State College. *U.S. Atomic Energy Commission,* ISC-700, Dec. 1955, 37 p.

Tests were made in reversed loading and in repeated tensile loading on 13 specimens of rolled alpha-uranium at room temperature. Constant strain rates ranging from 0.0003 in. per in. per min. to 0.0060 in. per in. per min. were employed.
(Q25n, Q27; U)

475-Q. Fretting Wear of Zircaloy-2 Pellets and Consequences Thereof. L. A. Waldman and P. Cohen. *U.S. Atomic Energy Commission,* WAPD-CPM-3, Jan. 9, 1956, 23 p. (CMA)

The fretting rate of Zircaloy-2 pellets in a packed bed was determined to be 4.1 mg. per sq. dm. and not serious with respect to clad integrity. The treatment of the data is analytical. Activity levels reached in the primary system with the above rate are not significant with respect to the loop compartment.
(Q9q; Zr, 6-17)

476-Q. Uranium Alloys for High-Temperature Application. Henry A. Saller, Ronald F. Dickerson and William E. Murr. Battelle Memorial Institute. *U.S. Atomic Energy Commission,* BMI-1098, June 25, 1956, 45 p.

Deals with some properties of uranium alloys with 3.5, 5, 7, 9 and 12% Mo and with 3, 5, 7, 10, 15 and 20% Zr. Results of a heat treatment study, hot hardness and dilation data, and effects of beta and gamma thermal cycling upon cylinders of both alloy groups are given.
(Q general, 1-12; U, *Mo, Zr*)

477-Q. The Creep of Zircaloy-2 Process Tubes. A. B. Burgess. *U.S. Atomic Energy Commission,* HW-45567, Sept. 17, 1956, 14 p. (CMA)

A consideration of the creep problems and related factors emphasized the determination of tube-wall thickness. Minimum thickness is limited by creep. Further information is desirable and several types of experiments are recommended. 22 ref.
(Q3; Zr, 4-10)

478-Q. The Mechanical Properties of Zirconium and Zircaloy-2. F. R. Shober, et al. *U.S. Atomic Energy Commission,* EMI-1168, Feb. 18, 1957, 48 p. (CMA)

A study of annealing time for zirconium and Zircaloy-2 showed that at 500° C. the softening rate was too fast for utilization of the increased tensile strengths from cold working. Zircaloy-2 decreased in creep-rupture strength in the 150-500° C. range in 1000-hr. tests. Rolled sheet showed no significant directional properties. Hydraulic bursting tests on seamless Zircaloy-2 and on welded zirconium tubing showed the superiority of the former; the latter failed at the longitudinal seam weld. 5 ref.
(Q general, 2-14; Zr)

479-Q. Flow Stress Recovery of Zircaloy-3B. D. E. Johnson. *U.S. Atomic Energy Commission,* HW-44906, 1956, 21 p. (CMA)

A study of changes in the mechanical properties of Zircaloy-3B at moderately high temperatures showed that increases in strength from cold working are soon lost. Partial recrystallization in 40 and 60% cold worked alloy is lost at 400° C. after 25 days and 12½ days, respectively. It is suggested that the creep rate and flow stress recovery of the alloy are intimately related.
(Q general, 3-18; Zr)

480-Q. Evaluation of Compression-Testing Techniques for Determining

Elevated-Temperature Properties of Titanium Sheet. W. S. Hyler. Battelle Memorial Institute. *U.S. Office of Technical Services,* Report 43, PB 121615, June 1956, 73 p. (CMA)

Techniques are evaluated for testing titanium sheet for high-temperature compression properties. Recommendations as to equipment and procedure. (Q28, 1-4, 2-12; Ti)

481-Q. Devices for Damping Mechanical Vibrations, a Bibliography. M. Benton. Naval Research Laboratory. *U.S. Office of Technical Services,* PB 121299, Dec. 1956, 101 p. $2.75.

References cover studies of vibration damping by increasing mechanical impedance of the system, by energy dissipation, or by tuned attachments, and of vibration isolation by vibration dampers, connection damping and material damping. (Q8)

482-Q. Investigation of the Mechanical Properties of Metal-Arc Welded Ti-6%-Al-4% V. D. M. Daley, Jr., and C. E. Hartbower. *Welding Journal,* v. 36, Apr. 1957, p. 185s-191s. (CMA)

Weld deposits of Ti-6Al-4V were prepared by inert-gas-shielded, tungsten-arc welding (Ti-6A1-4V filler) and evaluated for tensile and notch-bar properties. Tensile joint efficiency was about 100% at an ultimate tensile strength of 150,000 psi. and 10 ft-lb. V-notch Charpy impact energy at −40° C. The notch toughness of a weld produced by the inert-gas-shielded consumable-electrode process was studied and found to be greater than in other alpha-beta titanium alloys. (Q27a, Q6n; Ti, 7-1)

483-Q. Tungsten and the High-Temperature Age. R. H. Thielemann. *Western Machinery and Steel World,* v. 48, Mar. 1957, p. 112-115.

Problems in developing high-temperature alloys. Physical and tensile properties of columbium, molybdenum, tantalum and tungsten and possibilities of use at high temperatures; Stellite 31 modified by addition of tungsten showed double the rupture life at 600° F. and 30 times the rupture life with addition of tungsten plus columbium. (Q27a, Q3m; Cb, Mo, Ta, W, SGA-h)

484-Q. (German.) **Average Degree of Lengthening in Measuring Rolling Mill Rolls of Irregular Design.** Zymunt Wasatowski. *Neue Hütte,* v. 2, Jan. 1957, p. 24-35.

Theoretical comparison of various formulas proposed for estimating the average degree of lengthening. (Q24, W23)

485-Q. (Italian.) **Experimental Study of Internal Friction and Elastic Parameters in Ag-Au Alloys.** I. Barducci and L. Verdini. *Nuovo Cimento,* Suppl. to v. 4, Series X, no. 2, 1956, p. 1042-1056.

Silver-gold alloy chosen for study because of its simple phase diagram and complete compatibility of the two metals at all temperatures and in any proportions. Preparation of specimens, measuring methods, results. 13 ref. (Q21, Q22, 1-4; Ag, Au)

486-Q. (Japanese.) **Effect of Mo and V Additions on Si-Cr-W Steels for Shock-Resisting Tools.** S. Koshiba and T. Kuno. *Iron and Steel Institute of Japan, Journal,* v. 43, Feb. 1957, p. 142-145. (CMA)

The transformation point, quenching and tempering hardness, hardenability, microstructures, rate of deformation and mechanical properties at high temperatures were measured. A remarkable improvement in properties is noted when such additions are made. (Q general, J5, M27, 1-10; TS)

487-Q. Plastic Deformation of Single Crystals. M. S. Paterson. *Australian Institute of Metals, Journal,* v. 1, Oct. 1956, p. 112-124.

Literature review includes discussion of ductility of crystals and nature of slip and twinning. Section on crystallography and geometry of slip. Covers observations on nature of slip bands and deformation bands. Part on slip mechanics discusses sharp yield points, easy glide, effect of surface conditions, time, temperature and the application of dislocation theory to yielding and strain hardening. 115 ref. (Q24; 14-11)

488-Q. Deformation of Polycrystalline Aggregates. M. E. Hargreaves. *Australian Institute of Metals, Journal,* v. 1, Oct. 1956, p. 125-133.

Includes theories that attempt to calculate plastic properties of a polycrystalline aggregate from properties of single crystals. Experimental evidence relevant to these calculations and to the general behavior and interactions between metal grains in the deformation of aggregates. 22 ref. (Q24)

489-Q. Slow Deformation of Metals, Particularly at Elevated Tem-

peratures. R. C. Gifkins. *Australian Institute of Metals, Journal,* v. 1, Oct. 1956, p. 134-147.

Literature review gives empirical and formal expressions for creep curve; examines the functions of coarse slip, cell substructure, fine slip and boundary sliding in relation to theories of creep in pure metals and simple alloys. 76 ref. (Q3n, Q24)

490-Q. Fatigue. A. K. Head. *Australian Institute of Metals, Journal,* v. 1, Oct. 1956, p. 148-154.

Reviews research on mechanism of fatigue of simple metals such as copper, aluminum; experimental observations and theoretical explanations in bulk deformation, crack formation, and crack growth in metal fatigue. 30 ref. (Q7)

491-Q. Fracture. H. L. Wain. *Australian Institute of Metals, Journal,* v. 1, Oct. 1956, p. 155-169.

Theories on the mechanisms of fracture of metals. Assesses ideas in terms of experimental observations. Among hypotheses described are Orowan's to account for certain macrocharacteristics of fracture, Mott-Stroh's theories of stresses arising from dislocation pile-ups at obstacles, and Cottrell's of the locking of dislocations by specific impurity atoms. 59 ref. (Q26)

492-Q. Tensile Properties of Copper, Nickel and 70% Copper, 30% Nickel and 30% Copper, 70% Nickel Alloys at High Temperatures. William D. Jenkins, Thomas G. Digges and Carl R. Johnson. *Journal of Research of the National Bureau of Standards,* v. 58, Apr. 1957, p. 201-211.

The high-purity component metals and the two alloys were investigated in the initial conditions, as annealed for a uniform grain size, and as cold drawn to 40% reduction in area. The results were affected markedly by variations in the nickel content, temperature and degree of cold working. 13 ref. (Q27a, 2-12; Cu, Ni)

493-Q. Effect of Ceramic Coatings on Creep of Alloys. J. R. Cuthill, J. C. Richmond and N. J. Tighe. *Metal Products Manufacturing,* v. 14, Apr. 1957, p. 34-35.

Creep curves for two coated and uncoated 80-20 Ni-Cr alloy specimens under stress at an elevated temperature. Results show that the beneficial effect on the creep behavior of both alloys is sufficient to be of importance. (Q3m; Ni, Cr, 8-21)

494-Q. Assessment of the Drawing and Forming Qualities of Sheet Metal by the Swift Cup-Forming Test. Pt. 3. Correlation of the Test With Press Performance. O. H. Kemmis. *Sheet Metal Industries,* v. 34, Apr. 1957, p. 251-255.

Test results are compared to findings from automobile body press shop and press results for wheelbarrow, wash tubs and clutch covers. Correlation indicates possible usefulness of cup-forming tests in assessing materials for deep drawing. (Q23q, G4, 1-4)

495-Q. Hardness Testing of Sheet Metal. *Sheet Metal Industries,* v. 34, Apr. 1957, p. 267-272.

Results of survey of sheet metal industry in Great Britian to determine amount of standardization of hardness testing procedures. Data on diamond pyramid hardness test made by 73 firms on thin copper and hardened steel samples. (Q29c; ST, Cu, 4-3)

496-Q. Mechanical Properties of Steel Sheet Rolled From Continuously Cast Ingots. N. L. Komandin. *Sheet Metal Industries,* v. 34, Apr. 1957, p. 289-290.

Results of tensile, elongation and impact tests taken in logitudinal and transverse directions from conventional and continuously cast steel ingot at the Krasnoye Sormovo plant in the U.S.S.R. (Q27a, Q6n, D9q; ST, 4-3)

497-Q. Survey of the Problems of Delayed Cracking in Formed Titanium Parts. R. I. Jaffee and D. J. Maykuth. Battelle Memorial Institute, Report 7. *U.S. Office of Technical Services,* PB 124562, June 1955. 53 p. (CMA)

Hydrogen embrittlement and high residual stresses due to forming or assembly methods are the main reasons that Ti-8Mn sheet showed delayed cracking in the F-100 aft section. The recent Air Force specification of 150 ppm. of hydrogen is just adequate and may need downward revision. (Q26s, Q25h; Ti, 9-22)

498-Q. Formability Tests on Titanium Alloy Sheet. L. R. Jackson. Battelle Memorial Institute, Report 12, *U.S. Office of Technical Services,* PB 124565, July 1955, 25 p. (CMA)

Procedures for tensile testing and minimum-bend-radius testing of RC-

70 sheet. It is recommended that values be obtained for percent reduction in area and that all laboratories use the same method in bend test. (Q23q, 1-4, Q27, Q5; Ti, 4-3)

499-Q. Effect of Cold Reduction on Irreversible and Reversible Temper Brittleness. M. M. Shteinberg, V. D. Sadovskii and A. V. Demakova. *Henry Brutcher Translation* no. 3812, 10 p. (From *Metallovedenie I Obrabotka Metallov,* v. 2, no. 6, 1956, p. 26-35.) Henry Brutcher, Altadena, Calif.

Previously abstracted from original. See item 869-Q. 1956. (Q23, Q6, Q29, J29, CN)

500-Q. (French.) **Cast Irons With a High Modulus of Elasticity.** *Journal d'Informations Techniques des Industries de la Fonderie,* no. 84, Feb. 1957, p. 9-11.

General discussion and definition of modulus of elasticity; factors determining this property; steps to be taken to obtain cast iron with a high modulus of elasticity. (Q21a; CI)

501-Q. (French.) **Special Nickel-Chromium Alloys (Nimonics) for Gas Turbine Blades.** W. Betteridge. *Metaux-Corrosion-Industries,* no. 379, Mar. 1957, p. 111-121.

Mechanical properties and testing of Nimonic 80A and Nimonic 90 currently used on a large scale in the manufacture of rotor blades for gas turbines used in aviation; influence of different aging treatments on creep properties. (Q general, Q3m, T7; Ni, Cr)

502-Q. (French.) **Mechanical Properties of Nickel and Nickel Alloy Deposits.** H. C. Castell. *Metaux-Corrosion-Industries,* no. 379, Mar. 1957, p. 122-131.

Effects of the variation of hardness, internal stress, elastic limit and ductility on the behavior of different deposits of nickel; typical mechanical properties of nickel deposits (dull and bright) and of cobalt-nickel, zinc-nickel and phosphorus-nickel; application of such deposits; discussion of processes. 11 ref. (Q general, *Ni,* 8-12)

503-Q. (German.) **Dry Friction of Some Aluminium Alloys and Steels.** F. Bollenrath and H. Grefkes. *Aluminium,* v. 33, Apr. 1957, p. 234-240.

Review of the present state of knowledge of dry friction; determination of coefficients of friction; importance of structure and geometry of the surface layers; cold welding; frictional oxidation. 38 ref. (Q9p; Al, ST)

504-Q. (German.) **Buckling Tests With Aluminium Compression Members.** B. Braathen and B. R. Noton. *Aluminium,* v. 33, Apr. 1957, p. 241-249.

Theoretical ultimate loads were calculated using the tangent-modulus theory, the reduced-modulus theory and extended Southwell method. 12 ref. (Q28, 1-4; Al)

505-Q. (German.) **S.A.P., the Sintered Aluminum Material of High Hot Strength.** R. Irmann. *Aluminium,* v. 33, Apr. 1957, p. 250-259.

S.A.P. (sintered aluminum powder) produced from pure aluminum powder of prescribed particle size and oxide content has a range of special properties; it does not recrystallize, and neither its fatigue nor static strength fall to zero even after prolonged heating up to about 500° C. In these respects it is about five times better than all other aluminum alloys around 400° C. It also has considerably higher electrical and thermal conductivities and lower thermal expansion than aluminum alloys. It corrosion resistance is about that of pure aluminum. 49 ref. (Q27a, Q7a, P11, P15g, 2-12; Al. 6-22)

506-Q. (German.) **Structure, Hardness, Notch-Impact Strength and Magnetic Saturation of Heat Resistance Chromium-Manganese Steels With 2 to 6% Ni.** Helmut Krainer. *Archiv für das Eisenhüttenwesen,* v. 28, Feb. 1957, p. 81-89.

Investigation of 120 steel samples with 10 to 30% Cr, 3 to 20% Mn and 2.4 to 6% Ni after quenching from 1200° C. in water, after 1000 hr. annealing at 650° C. and after 100 hr. annealing at 800° C. Structure, determination of hardness, notch-impact strength and magnetic saturation. 16 ref. (Q29a, Q6n, M27, P16; AY)

507-Q. (German.) **New Testing Methods for Steel and Welding Materials in Large Welding Construction.** Henri M. Schnadt. *Oerlikon Schweissmitteilungen,* v. 15, no. 26, 1957, p. 5-87.

Theory, characteristics of stress and plastic deformation; neoplastic behavior of metal, behavior of metal under greater plastic deformation, breakage at a certain point, general stress requirements of welded construction, quality evalua-

tion of steel and welding materials. 107 ref. (Q25k, Q23; ST, 7-1)

508-Q. (German.) **The Notch Impact Test.** K. Rühl. *Schweissen und Schneiden,* v. 9, Mar. 1957, p. 83-90.

Design of specimen, factors influencing results, applications for the test. 17 ref. (Q6, 1-4, 1-10)

509-Q. (German.) **Application of Hardness Testing in Welding Practice.** N. Ludwig. *Schweissen und Schneiden,* v. 9, Mar. 1957, p. 98-102.

Correlation with other methods, advantages and limitations, main applications. (Q29; 7-1)

510-Q. (German.) **Material Tests at Low Temperatures.** H. Hildesheimer. *Schweissen und Schneiden,* v. 9, Mar. 1957, p. 117-119.

Purpose of testing, precooling or cooling in the machine, cooling media and devices. 2 ref. (Q general, 1-4, 2-13)

511-Q. (German.) **On the Determination of Young's Modulus on Small Construction Elements.** Wolfram Ruff, Gottfried Meudt and P. Schillmöller. *Zeitschrift für Metallkunde,* v. 48, Mar. 1957, p. 119-125.

Very small extension can easily be determined with the pneumatic extensometer, thus being applicable to Young's modulus measurements. Straight bars and piston rings of steel, gray cast iron and light metals were used. 5 ref. (Q21a, 1-3; ST, CI, EG-a39)

512-Q. (German.) **Investigations of the Structure and the Strength Characteristics of Die Forgings From Al-Cu-Mg and Al-Zn-Cu-Mg Alloys.** Wilhelm Rosencranz. *Zeitschrift für Metallkunde,* v. 48, Feb. 1957, p. 41-53.

Investigation of the influence of the press type (hydraulic, toggle lever and screw press) and of the forging temperature and the solution annealing (salt bath and air circulation) on the microstructure and on the static and dynamic strength values. Quality of different forgings. 2 ref. (Q27a, M28k, F22; Al)

513-Q. (Russian.) **Some Properties of Alloys of Zirconium With Columbium.** Yu. F. Bychkov, A. N. Rozanov and D. M. Skorov. *Atomnaya Energiya,* v. 2, Feb. 1957, p. 146-151.

The constitutional diagram of the system zirconium-columbium constructed on the basis of the experimental data obtained. The results of elongation tests to which zirconium-columbium alloys have been subjected at room temperature. The heat resistance of these alloys was evaluated by measuring their hardness at 750° C. and also by determining the changes in this hardness occurring as a result of low-temperature tempering (aging). The data obtained are interpreted on the basis of the constitutional diagram. The heat resistance of alloys which oxidize in air at 570 and 650° C. has been determined. (Q27a, Q29n, 2-12; M24a; Zr, Cb)

514-Q. (Russian.) **Young's Modulus of Alloys of Zirconium With Columbium.** Yu. F. Bychkov, A. N. Rozanov and D. M. Skorov. *Atomnaya Energiya,* v. 2, Feb. 1957, p. 152-156.

Results of measuring the Young's modulus of zirconium-columbium alloys in vacuum at temperatures up to 950° C. Elasticity also measured at room temperature after various types of heat treatment. (Q21a, 1-4, 2-14; Zr, Cb)

515-Q. (Book.) **Introduction to Plasticity.** Aris Phillips. 229 p. 1956. Ronald Press Co., 15 East 26th St., New York, N. Y. $7.

An introduction to the rapidly developing field of metal plasticity for the advanced undergraduate and graduate student of engineering and the practicing engineer. Plastic bending and the procedure of superposing perfectly plastic materials explained in detail, deflections of statically determinate and indeterminate beams and frames considered, increment theory and the results obtained by experimental data discussed, and limit design of structures in the presence of combined stresses explained. (Q23)

516-Q. Investigation of the Fracture of Light Rolled-Steel Sections. K. J. Pascoe. *British Welding Journal,* v. 4, Mar. 1957, p. 133-146.

Lengths of light sections of mild steel and three structural alloy steels with discontinuities which included machined notches and welds were loaded in bending at 0 and minus 60° C. to investigate possibility of cleavage fracture. (Q26n; CN, AY)

517-Q. Temper Brittleness of Boron-Treated Steels. S. J. Rosenberg. *National Bureau of Standards, Journal of Research,* v. 58, Apr. 1957, p. 175-187. (CMA)

Two series of boron-treated steels studied for the effect of titanium and zirconium on impact properties, particularly temper brittleness. Small amounts of titanium, such as introduced by boron addition agents, can increase the susceptibility to temper brittleness and impair the Charpy V-notch impact properties of steels tempered at 1200° F. No adverse effects were proved against zirconium.
(Q6n, Q26s, 2-10; ST, *B, Ti, Zr*)

518-Q. Analysis of Zircaloy-2 Creep Data With Two Extrapolation Methods. K. R. Merckx. *U.S. Atomic Energy Commission,* HW-42547, Apr. 17, 1956, 9 pp. (CMA)

Experimental creep data for Zircaloy-2 are extrapolated into the low creep rate range (10^{-8} in. per in. per hr.). The temperature range for which experimental data are tabulated is 300-932° F. The low creep rates at 650 °F. are self-consistent, but are inconsistent with values obtained at other temperatures. This anomaly is considered in the light of strain aging and different creep laws. Equations used are shown. (Q3n; Zr)

519-Q. Effect of Composition on the Stored Energy of Cold Work and the Deformation Behavior of Gold-Silver Alloys. P. Greenfield and M. B. Bever. *Acta Metallurgica,* v. 5, Mar. 1957, p. 125-130.

Energy stored in chips formed by drilling at room temperature and at −195° C. was determined for five gold-silver alloys in composition range from 35 to 98 at. %. Energy varies with composition and temperature of deformation. Energy expended in deformation is larger at lower temperature and increases with increasing concentration of solute. 16 ref.
(Q24f, Q24g, 2-10; Au, *Ag*)

520-Q. Effect of Graphitization of Steel on Stress-Rupture Properties. Joseph G. Wilson. *American Petroleum Institute, Proceedings,* v. 36 (III), 1956, p. 78-86.

The most serious conditions encountered with regard to loss of rupture strength are the presence of defects in the welds and the presence of low-strength weld metal. Although concentrated forms of graphite at weld heat affected zones may adversely affect the rupture strength of steel within the concentrations encountered in this investigation, other factors, such as weld quality, are of great importance. Random forms of graphite, even up to "moderate" degrees, in the unaffected parent metal do not appear to be detrimental to either rupture strength or rupture ductility.
(Q3m, N8s; ST)

521-Q. Abrasion Resistance: Measurement of Coated Surfaces. *Electroplating and Metal Finishing,* v. 10, Apr. 1957, p. 109-113.

Techniques and apparatus used in determining abrasion resistance of decorative or protective metal platings; several blasting and rubbing test methods. 12 ref.
(Q9n, 1-4; 8-12)

522-Q. Fatigue Under Triaxial Stress: a Testing Machine and Preliminary Results. J. L. Morrison and J. S. C. Parry. *Engineering,* v. 183, Apr. 5, 1957, p. 428-432.

An example of triaxial stress is provided by a thick cylinder subjected to repeated internal pressure. (Q7f, 1-3)

523-Q. Fatigue of Metals. K. N. Leibovic. *Industrial Chemistry,* v. 33, Apr. 1957, p. 194-195.

Some aspects of metal fatigue of interest to chemical engineers, particularly on the design and use of structures and machines. (Q7, 17-1)

524-Q. Testing Indentation and Abrasive Hardness of Hard Materials. P. Grodzinski. *Industrial Diamond Review,* v. 17, Mar. 1957, p. 46-50.

Physical properties of diamonds; crystal structure, morphology and indentation hardness. (Q29c; NM-k37)

525-Q. Structural Damping of a Simple Built-Up Beam With Riveted Joints in Bending. T. H. H. Pian. *Journal of Applied Mechanics,* v. 24, Mar. 1957, p. 35-38.

An analytical expression of the energy loss per cycle of static loading is derived in terms of amplitude of load, stiffness of rivets and tightness of joint. Experimental measurements on a test steel beam provide a qualitative verification of the theory. (Q8; ST)

526-Q. Some New Data on High-Speed Impact Phenomena. J. H. Huth, J. S. Thompson and M. E. van Valkenburg. *Journal of Applied Mechanics,* v. 24, Mar. 1957, p. 65-68.

Experimental results for steel, aluminum, brass, lead, magnesium

and a magnesium-lithium alloy. (Q6n; ST, Al, Cu, Pb, Mg)

527-Q. A Theoretical Criterion for the Fracture of Metals Under Combined Alternating Stresses. Takeo Yokobori. *Journal of Applied Mechanics,* v. 24, Mar. 1957, p. 77-80.

A criterion is developed on the basis of the present concepts of dislocations. (Q26r)

528-Q. Creep Properties From Short Time Tests. Ervin E. Underwood. *Materials and Methods,* v. 45, Apr. 1957, p. 127-129.

Curves illustrate straight-line relationship between ultimate tensile strength or creep-rupture stress and hot hardness; correlation of time and temperature parameters for high-alloy steel.
(Q3m, Q27a, Q29n; AY, SS)

529-Q. Cold Work Improves Age Hardening Stainless. John T. Richards and Ellsworth M. Smith. *Metal Progress,* v. 71, May 1957, p. 71-75.

Age hardenable stainless may require complex and precise heat treatments for optimum properties. When mill annealed strip is rolled to hard or half-hard temper it has fair formability and age hardens to higher strengths during a simple reheating. (Q23q, J27d, 3-18; SS)

530-Q. Dynamics of Twinning and the Interrelation of Slip and Twinning in Zinc Crystals. R. L. Bell and R. W. Cahn. *Royal Society Proceedings,* v. 239, Apr. 9, 1957, p. 494-521.

Zinc crystal wires in which the basal plane was nearly parallel to the wire axis were found to twin at abnormally high stresses. No single critical resolved shear stress exists; resolved shear stresses near 3.7 kg. per sq. mm. were common for short crystals, while longer crystals (which often fractured at the instant of twinning) had an average critical stress of 2.9 kg. per sq. mm. (Q24a, Q24b; Zn)

531-Q. Investigations of Deformation and Fracture of Metals. R. P. Carreker, R. W. Guard and R. E. Lenhart. General Electric Research Laboratory. (Wright Air Development Center). *U.S. Office of Technical Services,* PB 111838, May 1955, 25 p. $.75.

Plastic deformation behavior of pure metals as a function of temperature and grain size; correlations of the stress, strain and strain rate were made on a phenomenological basis for both tensile and creep tests and the resulting data applied to examination of current concepts of deformation. (Q24, Q26s)

532-Q. Survey of Low-Alloy Aircraft Steels Heat Treated to High Strength Levels. Pt. 1. Hydrogen Embrittlement. G. Sachs and W. Beck. Syracuse University. (Wright Air Development Center). *U.S. Office of Technical Services,* PB 121700, June 1956, 96 p. $2.50.

The magnitude of hydrogen embrittlement was found to depend greatly upon numerous mechanical, chemical and electrochemical factors encountered in the making, shaping, heat treating and finishing of aircraft parts.
(Q26s, T24, 17-7; AY, *H*)

533-Q. Investigation of Forged Cobalt-Base Alloys for High-Temperature Applications. R. R. MacFarlane, R. K. Pitler and E. E. Reynolds. Allegheny Ludlum Steel Corp. (Wright Air Development Center). *U.S. Office of Technical Services,* PB 121723, Oct. 1956, 36 p. $1.00.

Improvements in the high-temperature properties of a wrought cobalt-base alloy resulted from additions of aluminum, boron and titanium.
(Q general, 2-12, 2-10; Co, *Al, B, Ti*)

534-Q. Effect of Changing Cyclic Modulus on Bending Fatigue Strength. A. A. Blatherwick and B. J. Lazan. University of Minnesota. (Wright Air Development Center). *U.S. Office of Technical Services,* PB 121816, Oct. 1956, 129 p. $3.25.

A phenomenological study of the effect on fatigue strength of changes in the cyclic secant modulus, or the ratio of the maximum stress to the maximum strain of the cyclic stress-strain hysteresis loop. (Q7g)

535-Q. Materials - Property - Design Criteria for Metals. Pt. 4. Elastic Moduli, Their Determination and Limits of Application. S. A. Gordon, R. Simon and W. P. Achbach. Battelle Memorial Institute. (Wright Air Development Center). *U.S. Office of Technical Services,* PB 121857, Oct. 1956, 23 p. $.75.

The modulus of elasticity at elevated temperatures for several materials as it is derived from the conventional stress-strain curve and from the determination of the ve-

locity of propagation of elastic waves. (Q21a, 1-4, 2-12)

536-Q. (Czech.) **Internal Damping of Chromium Steels.** Joseph Vodsedalek. *Materialovy Sbornik,* 1956, p. 5-25.

Definitions of the internal damping of materials; causes discussed; factors which influence damping determined. The magneto-mechanical component of damping is treated with great care since it plays a principal part with chromium steels at the usual cyclic tensions. 12 ref. (Q8; AY, *Cr*)

537-Q. (French.) **Influence of Graphite on the Mechanical Characteristics of Unalloyed Gray Iron With Laminated Graphite.** Michel Ferry. *Fonderie,* no. 134, Mar. 1957, p. 113-131.

Discusses changes in strength and structure as determined by graphite content with special reference to density, modulus of elasticity, hardness and tensile strength. Experimental conditions are outlined together with resultant conclusions. 18 ref. (Q general, 3-21, CI-n)

538-Q. (French.) **Alloyed Cast Irons With Spheroidal Graphite. Some Recent French Applications.** R. A. Chavy. *Revue de Nickel,* v. 23, Jan-Feb-Mar. 1957, p. 13-17.

Improved mechanical and physical properties of gray iron resulting from the substitution of spheroidal graphite for laminated graphite. Discusses nickel-manganese and nickel-molybdenum-manganese alloys. (Q general, M27, 3-21; CI-r)

539-Q. (French.) **Hydraulic Recoil in Iron Wire.** A. De Saedeleer. *Revue Universelle des Mines,* v. 13, Apr. 1957, p. 142-153.

Consideration of plastic deformation resulting from the breaking of metallic wire by traction. The sudden removal of the original state of stress produces in the sections a longitudinal vibratory movement. Analysis of vibratory phenomena. (Q10, Q8; Fe, 4-11)

540-Q. (German.) **On the Characteristics of Impact-Stressed Nitrided Steels.** H. Wiegand and M. Koch. *Werkstatt und Betrieb,* v. 90, May 1957, p. 269-273.

Characteristics of nitrided parts in the case of stressing due to tension, variation and impact. (Q6n, Q27a; ST, 14-19)

541-Q. (German.) **Admissible Stresses of Shafts in Machine Building.** Richard Hänchen. *Werkstatt und Betrieb,* v. 90, May 1957, p. 317-321.

Fatigue resistance for smooth shafts, admissible stresses for deflection and torsion, and admissible bending and torsion stresses for shafts with shoulders, cross drillings and hub seats. (Q7a, Q1a, Q5g, 17-1)

542-Q. (Italian.) **Anisotropy and Nonhomogeneity of Fatigue Resistance in High-Strength Light Alloys.** C. Panseri and F. Gatto. *Alluminio,* v. 26, Mar. 1957, p. 101-106.

Experiments showed fatigue resistance of extruded bars of Avional (Al-Cu-Mg) to be greater longitudinally (in direction of extrusion) than in transverse directions and at 45°; moreover, samples taken from sides of extruded material showed a greater resistance than those taken from center. Anisotropy and nonhomogeneity not found in Ergal (Al-Zn-Mg-Cu). 7 ref. (Q7a, 1-10; Al, 4-8)

543-Q. (Italian.) **Influence of Specimen Shape on the Fatigue Resistance of Al-Zn-Mg-Cu Alloy (Ergal 65TA). New Studies.** F. Gatto. *Alluminio,* v. 26, Mar. 1957, p. 107-110.

Toroidal and cylindrical specimens tested; rotary bending strength was not appreciably influenced by shape of specimens. 6 ref. (Q7g, 1-10; Al)

544-Q. (Polish.) **Use of Other Elements in Place of Molybdenum in Steels for Steam Superheater Tubes.** W. Tomaszczyk. *Prace Instytutow Ministerstwa Hutninctwa,* v. 9, 1957, p. 13-40.

A group of steels with a lower content of molybdenum was investigated: chromium-molybdenum type, chromium-molybdenum-vanadium type, manganese-silicon type, chromium-vanadium type, chromium-tungsten type and chromium-tungsten-vanadium type. The behavior of these steels was investigated in tension tests and impact tests at room and at elevated temperatures. 37 ref. (Q27a, Q6n, 1-12; AY, 4-10)

545-Q. (Polish.) **Coarse Crystalline Fracture of 18 HNWA Steel.** J. Ogerman. *Prace Instytutow Ministerstwa Hutnictwa,* v. 9, 1957, p. 41-55.

Trials were made to determine the effects on 18 HNWA steel fracture caused by annealing at high temperature (in the range between 1200 and 1350° C.), the rate of cooling from the above temperatures, the applied final heat treatment and the extent of forging. 29 ref. (Q26, M27d, 2-14; AY)

546-Q. (Portuguese.) **Dynamic Traction Tests on Steel.** R. M. Otto Weinbaum. *ABM, Boletim da Associacao Brasileira de Metais,* v. 13, Jan. 1957, p. 41-49.

Tests performed on notched specimens of mild steel; volume of notched section was varied in five different sets of test pieces. Tests confirm that the greater the volume of the material subjected to stress, the larger the amount of energy consumed in fracture of test piece. (Q27, 1-10; CN)

547-Q. Brittle Fracture: a Hazard in Chemical Plant. A. A. Wells. *British Chemical Engineering,* v. 2, Apr. 1957, p. 186-191.

Conditions which give rise to brittle fractures and discusses practical precautionary measures; transition temperature, residual stress and plastic strain distribution in welded parts are illustrated. 7 ref. (Q26s, Q23r, T 29, 17-7; 7-1)

548-Q. Suitability of Quenched and Tempered Steels for Pressure Vessel Construction. Leon C. Bibber. *Compressed Gas Assocication,* 43rd Annual Report, Supplement, 1955, p. 17-32.

Amount of ductility needed for fabrication and operation, elastic ratios, relationship between ductility and toughness, the necessity for stress-relieving; destructive tests of eight full-scale pressure vessels. 8 ref. (Q23p, Q21, T26q, 17-7; ST)

549-Q. Influence of Surface Roughness on the Fatigue Strength of Steels and Nonferrous Alloys. E. Siebel and M. Gaier. *Engineers Digest,* v. 18, Mar. 1957, p. 109-112. (Translation from *VDI Zeitschrift,* v. 98, Oct. 31, 1956, p. 1715-1723).

From a series of steels and nonferrous alloys in a specified heat treated condition, fatigue test specimens were machined to a specified degree of surface roughness and were tested in push-pull, bending, tension, and torsion. An attempt is made to establish design formulas for various machining processes from the results of these tests. 7 ref. (Q 7a, G17, 17-1)

550-Q. Fatigue of Aircraft. P. L. Teed. *Institution of Production Engineers, Journal,* v. 36, Mar. 1957, p. 154-164.

History of fatigue theory; causes of fatigue; discussion of stress concentrations, scatter in fatigue test results and influence of built-in stresses. (Q7, T24, 17-7)

551-Q. On the Stress Distribution at the Base of a Stationary Crack. M. L. Williams. *Journal of Applied Mechanics,* v. 24,, Mar. 1957, p. 109-114.

Remarks upon antisymmetric, as well as symmetric, stress distribution, and the circumferential distribution of distortion strain-energy density. (Q25k, 9-22)

552-Q. Neutron Radiation Effects on Tensile and Impact Properties of ASTM-A302 B Steel. E. E. Baldwin. *Mechanical Engineering,* v. 79, Mar. 1957, p. 261-265.

Comparison of tensile and impact data on irradiated and unirradiated specimens showed that the separate and combined effects of temperature and radiation had only minor effects (less than 10%) upon tensile and impact properties. (Q27a, Q6n, 2-17; AY)

553-Q. Rupture Strength of Several Nickel-Base Alloys in Sheet Form. James H. Dance and Francis J. Clauss. *National Advisory Committee for Aeronautics,* Technical Note 3976, Apr. 1957, 24 p.

An investigation was conducted to determine the 100-hr. rupture strengths at 1200 and 1350° F. of Inconel "X", Inconel 700, Incoloy 901, Refractaloy 26, and R-235 sheet alloys in both the annealed and heat treated conditions. Strengths of these alloys were compared with published data for other sheet alloys and bar stock. 15 ref. (Q3m; Ni, 4-3)

554-Q. Work-Hardening and Work-Softening of Face-Centered Cubic Metal Crystals. A. Seeger, J. Diehl, S. Mader and H. Rebstock. *Philosophical Magazine,* v. 2, 8th ser., Mar. 1957, p. 323-350.

Investigates by experiment and theory the mechanisms governing work-hardening, work-softening and slip band formation in face-centered cubic metals. 45 ref. (Q24, M26)

555-Q. Metal Fatigue at High Frequency. E. A. Neppiras. *Physical Society Proceedings, Section B,* v. 70, Apr. 1, 1957, p. 393-401.

Metal samples were subjected to tension-compression stresses above the fatigue limit at frequencies around 18 kc. produced by a resonant magnetostriction transducer. The work has shown that the high-frequency technique possesses a number of advantages over conventional methods of fatigue analysis.

But the measurements confirm that at this frequency the fatigue limit is appreciably higher than that obtained from low-frequency measurements. (Q7, 1-4)

556-Q. Hardness of Printing Metals. F. G. Wallis. *Process,* v. 64, Mar. 1957, p. 106-107.

Determination of the effects of heating upon the hardness of metals and the effects of processing and printing upon hardness. (Q29n, T9n, 17-7)

557-Q. True Stress-Strain Properties of Natural Uranium. M. T. McGowan and R. M. Treco. Bridgeport Brass Co. *U.S. Atomic Energy Commission,* BRB-34, Nov. 30, 1956, 25 p.

It is shown that a composite true stress-strain curve for uranium may be derived from a combination of swaging prestrains and conventional tensile testing. (Q25n; U)

558-Q. Relationship of Hardness Measurements to the Tensile and Compression Flow Curves. R. E. Lenhart. General Electric Research Laboratory. (Wright Air Development Center). *U.S. Office of Technical Services,* PB 121144, June 1955, 14 p. $1.50.

Correlation of hardness and tensile tests and conversion of one measurement to the other was found workable. Results of experimentation with magnesium-aluminum alloys showed that the approximation of a uniaxial tensile stress flow curve from hardness measurements is possible by utilizing empirical conversion constants. (Q29n, Q27a)

559-Q. Creep, Fracture, and Bending of Lead and Lead Alloy Cable Sheathing. Curtis W. Dollins and Cecil E. Betzer. *University of Illinois Engineering Experiment Station,* Bulletin 440, Nov. 1950. $.65.

Tests have covered principally long-time creep under steady tensile stresses up to 300 psi. at 110 and 150° F., time to fracture and ductility under steady stresses of 400 to 1800 psi. at room temperature and 110° F., and life to fracture in slow bending to strains of 0.3 to 0.5%. The arsenical lead alloys have outstanding ability to withstand slow bending of the type that occurs in service because of the daily expansion and contraction of the cable in the duct between manholes. (Q3m, Q5g, T1b, 17-7; Pb)

560-Q. Static Strength of Rivets Subjected to Combined Tension and Shear. William H. Munse and Hugh L. Cox. *University of Illinois Engineering Experiment Station,* Bulletin 437, Dec. 1956, $.45.

A large number of rivets have been tested to determine the behavior of rivets under combined stresses and to evaluate the effect on this behavior of such variables as type of rivet, grip, diameter and method of driving. It has been found that a relatively simple relationship can be derived which expresses the strength of a rivet in terms of the shear and tension to which it is subjected. (Q27a, Q2g, K13n, T7d, 17-7)

561-Q. Torsional Properties of Steels at High Rates of Strain. Paul G. Jones and Thomas J. Dolan. *University of Illinois Engineering Experiment Station,* Bulletin No. 438, Feb. 1957, $.35.

Effects of strain rate, temperature, type of notch and size of specimen on four steels tested in torsion. Torque, angle of twist and time were continuously recorded and properties were determined. (Q1a, 1-4)

562-Q. Influence of Weld Faults on Fatigue Strength With Reference to Butt Joints in Pipe Lines. R. P. Newman. *Welding Research Abroad,* v. 3, Mar. 1957, p. 9-28.

Testing was by alternating plane bending to develop stresses transverse to the joint. It was found that the root zone of welds, with and without backing rings, exercised a predominant influence on fatigue behavior. Except in the case of lack of pentration, defects had no significant effect on fatigue strength because of the over-riding influence of root zone. (Q7a, K9)

563-Q. (English.) **Shear Strength at Elevated Temperatures of an Aluminium Alloy Honeycomb Core Bonded to Loading Plates With Two Types of Adhesive Films.** Bryan R. Noton. *Flygtekniska Försöksanstallen, Aeronautical Research Institute of Sweden Report 72,* Jan. 1957, 35 p.

Shear tests have been carried out at temperatures up to 100° C. on a honeycomb core from the U.S.A. in 3S-H19 aluminum alloy. The density of the core was 87 kg. per cu. m. (5.4 lb. per cu. ft.). The cell size was 9.5 mm. (0.375 in.) and the foil thickness, 0.1 mm. (0.004

in.) The Redux 775 and the Bloomingdale FM-47 adhesive films were investigated for bonding the core to the shear-transmitting plates. 15 ref. (Q2g, K12; Al, 7-9)

564-Q. (Czech.) **Plastic Deformation of Steel.** Jaroslav Nemec. *Hutnické Listy,* v. 12, Apr. 1957, p. 315-324.

Fundamental questions concerning the possibility of calculating plastic deformation in inhomogenous material; examines static strength of ductile steels from fundamental physical deformation values of ferrite; discusses the mathematical bases as well as conclusions of the theory of instantaneous states in plastic deformation, and the theory of plastic deformation velocity; the results indicate the range of validity and applicability of the theory of instantaneous deformation states in plastic steels. (Q24; ST)

565-Q. (Czech.) **Contribution to the Investigation of the Qualities of Heat Resisting Iron-Aluminum Alloys.** Jaroslaw Pluhar. *Materialovy Sbornik,* 1956, p. 97-115.

Strength at high temperatures, weldability and heat resistance of welds are treated in detail. Tendency of decomposition of some of these alloys, and conditions to prevent this phenomenon. The properties of Pyroferal are compared with those of the usual heat resistant alloys of the chromium and chromium-nickel type. 24 ref.
(Q general, 2-12; SGA-h, Fe, Al)

566-Q. (French.) **On the Resistance of Metals to Repeated Shock.** Jean Fossiez, Raymond Sitte and Stanislas Ziembinski. *Comptes Rendus,* v. 244, Feb. 18, 1957, p. 1008-1011.

Experiments on steel: successive sharp tensile stresses produced by a periodically excited electromagnet, intensity measured by a piezoelectric quartz dynamometer. Influence of frequency of shock; pseudo-aging of the metals; influence of elastic shocks. (Q6p)

567-Q. (French.) **Conditions Governing the Appearance of the Yield Point at the Elastic Limit as Observed on the Stress-Strain Curves of Pure Iron.** Bernard Migaud and Jean Talbot. *Comptes Rendus,* v. 244, Mar. 25, 1957, p. 1771-1774.

Reference is to Cottrell's interpretation of yield point of stress-strain curves of iron when passing from elastic to plastic state. This yield point no longer exists after a cold reduction operation but reappears in the case of pure electrolytic iron containing a trace of carbon and only when it precipitates from the solid solution. 5 ref. (Q21; Fe-a)

568-Q. (French.) **Water Hammer Effect in an Iron Wire.** A. de Saedeleer. *Revue Universelle des Mines,* v. 13, April, 1957, p. 142-153.

Analysis of vibratory phenomenon occurring at imbedded ends of wire broken on tensile test machine. (Q27f; Fe, 4-11)

569-Q. (German.) **On the Attainable Accuracy of Ball Thrust Hardness Tests and Gaging the Indentation Depth.** Kurt Potyka. *Werkstatt und Betrieb,* v. 90, May 1957, p. 274-276.

Brinell and Vickers hardness tests, when done without first grinding the test area, showed no satisfactory results with regard to the accuracy of the hardness values to be determined. (Q29b)

570-Q. (Italian.) **Sulphur Surface Hardening of Steel: Morphology and Characteristics of Layers.** N. Collari and P. Virdis. *Metallurgia Italiana,* v. 49, Mar. 1957, p. 159-169, 211.

The layers obtained on steel through a sulphur hardening treatment, and anti-friction properties in friction couplings have been chemically and metallographically tested to ascertain wear resistance. The possible causes, both chemical and physical, which may determine the favorable anti-wear and anti-friction behavior are briefly reviewed. 28 ref. (Q9n, J28; ST)

571-Q. (Italian.) **Influence of Work Hardening and Annealing on Mechanical Properties of Al-Mg Alloys.** F. Gatto and L. Mori. *Metallurgia Italiana,* v. 49, Apr. 1957, p. 253-264.

Experimental investigation on work hardening and annealing of aluminum-magnesium alloys with different magnesium contents, carried out mainly through tensile tests. The results were analyzed by showing the influence of work-hardening degree, annealing temperature, treating time, and magnesium content. (Q23a, J23; Al, Mg)

572-Q. (Italian.) **Zama Alloys for Die Castings.** Ludovica Alladio. *Rivista di Meccanica,* no. 156, Mar. 2, 1957, p. 31-33.

Effects of aluminum, copper, magnesium, lead, cadmium, tin and iron

content on mechanical properties of die castings made of Zama alloys. (Q general, 1-10; Zn, 5-11)

573-Q. (Japanese.) **Fatigue Life of Metallic Materials Under Varying Repeated Stresses of Two Different Stress Waves.** Toshio Nishihara and Toshiro Yamada. *Japan Society of Mechanical Engineers, Transactions,* v. 23, Mar. 1957, p. 136-141.

Notched specimens of carbon steel and duralumin tested and results were used to calculate fatigue life. (Q7b; CN, Al)

574-Q. (Japanese.) **On the Fracture of Metals (2nd Report). Tensile Fracture Test of Mild Steel Round Bars Having Hyperbolic Notch and Notch Brittleness.** Masuji Uemura. *Japan Society of Mechanical Engineers, Transactions,* v. 23, Mar. 1957, p. 148-154.

Based on the premise that there exist shear and tensile fracture modes, various fracture behaviors are explained together with some observations on notch brittleness. 11 ref. (Q26; CN)

575-Q. (Japanese.) **Primary Creep of Mild Steel.** Toshio Nishihara, Shuji Taira, Kichinosuke Tanaka and Masateru Onami. *Japan Society of Mechanical Engineers, Transactions,* v. 23, Mar. 1957, p. 154-159.

An empirical formula is introduced concerning the relation between transient creep rate, stress and temperature. (Q3m, Q3n; CN)

576-Q. (Japanese.) **On the Fatigue Limit of Steel Specimens With Cold-Rolled V-Notch. (Increase of Fatigue Strength Due to Artificial Aging.)** Yuich Kawada and Hajime Nakazawa. *Japan Society of Mechanical Engineers, Transactions,* v. 23, Mar. 1957, p. 190-193.

Extent of the effect of low-temperature annealing; variation in hardness due to aging. 8 ref. (Q7a, 2-15; ST)

577-Q. (Japanese.) **Study on Some Effects on Shore Hardness Number (5th Report) on the End Effect.** Shuro Machida. *Japan Society of Mechanical Engineers, Transactions,* v. 23, Mar. 1957, p. 230-237.

Tests made with Shore scleroscope of D-type on many specimens of different hardness. The end effect on the Shore hardness number is explained. (Q29)

578-Q. (Japanese.) **On the Changes of Mechanical Properties and Microstructures of Commercially Pure Titanium Sheets by Cold Rolling and Annealing. I.** Y. Kondo and S. Suzuki. *Sumitomo Metals,* v. 8, July 1956, p. 26-47. (CMA)

Microstructural and mechanical property changes in commercial titanium sheet from cold rolling and annealing included a loss of ductility at about 500° C. and a higher hardness at the surface than below it for cold rolled specimens. Heating and cooling speeds showed no effect on the hardness and tensile properties. Tensile properties vs. tensile speed, specimen shape and annealing time and temperature were among the relationships studied. Work hardening and annealing characteristics are discussed. (Q27a, Q29n, M27a, 2-14, 318; Ti-a, 4-3)

579-Q. (Pamphlet.) **Engineering Properties of Nickel. Technical Bulletin T-15, 7th Ed. 23 p. 1956.** International Nickel Co., Inc., 67 Wall Street, New York 5, N. Y.

Tables and graphs of mechanical property ranges of nickel alloys. (Q general; Ni)

580-Q. (Pamphlet.) **Engineering Properties of "K" Monel and "KR" Monel. Technical Bulletin T-9, 12th Ed. 27 p. 1956.** International Nickel Co., Inc., 67 Wall St., New York 5, N. Y.

Graphs, tables and notes. (Q general; Ni)

581-Q. Activation Energies for Creep of High-Purity Aluminum. O. D. Sherby, J. L. Lytton and J. E. Dorn. *Acta Metallurgica,* v. 5, Apr. 1957, p. 219-227.

Activation energies for creep were obtained over temperature range from 77 to 880° K. by rapidly changing the temperature during creep at constant stress. From data obtained validity of theories that postulate stress or strain-dependent activation for creep is questioned. (Q3m, P13a; Al-a)

582-Q. Factors Relating to the Stress-Strain Properties of Cast Iron. G. N. J. Gilbert. *British Cast Iron Research Assoc. Journal of Research and Development,* v. 6, Apr. 1957, p. 546-587.

Mechanism of failure and stress-strain properties are described by considering cast iron as steel plus graphite. Equations giving relationship between stress and strain are considered. (Q25n; CI)

583-Q. Magnesium Alloy Castings: Heat Treatment After Welding Repairs. K. Kornfeld. *Canadian Metals,* v. 20, Apr. 1957, p. 50-60.

Investigation of differences between mechanical properties of unwelded magnesium AZ91 castings versus combined properties of deposited weld metal and parent castings after different heat treatments. Heat treamtents include solution treatment before welding and for stress relief after welding. (To be concluded.)
(Q general, 2-14, J27a, J1a, Mg, 5)

584-Q. Laying the Ghost of the Welded Ship. H. J. Nichols. *Canadian Metalworking,* v. 20, May 1957, p. 46-48.

Brittle failures are not restricted to welding. Examples of brittle failures of riveted structures.
(Q26s, T24g, 7-1, 7-3)

585-Q. Ni Alloys Shine at High Temperatures. R. M. Wilson and W. F. Burchfield. *Chemical Engineering,* v. 64, May 1957, p. 298-306.

Physical and mechanical properties of nickel and nickel alloys at high temperature.
(Q general, P general, 2-12; Ni)

586-Q. Improved Methods of Testing the Adhesive Strength of Metallic Coatings on Wires. E. A. Franke. *Engineers Digest,* v. 18, Apr. 1957, p. 151-152. (Translated from *Metalloberfläche,* v. 11, Feb. 1957, p. 53-59.)

Methods of testing metallic coatings of wire; torsion test, rolling test, bending test under tension and impact test. (Q10c, Q general; 4-11)

587-Q. Fatigue Under Triaxial Stress: Development of a Testing Machine and Preliminary Results. J. L. M. Morrison, B. Crossland and J. S. C. Parry. *Institution of Mechanical Engineers, Proceedings,* v. 170, 1956, p. 697-712.

Reasons for attempt to investigate effect of repeated triaxial stresses discussed. In particular the case of the thick cylinder subjected to repeated internal pressure. is considered. The design and development of a machine capable of repeatedly applying to cylinders internal pressures of the order 20 tons per sq. in. (3,000 atm.) are described in some detail. 5 ref. (Q7f, 1-3)

588-Q. Fatigue Strength of Specimens Containing Cracks. N. E. Frost and C. E. Phillips. *Institution of Mechanical Engineers, Proceedings,* v. 170, 1956, p. 713-725.

Determination of the fatigue limit and the strength reduction factor of cracked specimens. 13 ref.
(Q7a, 9-22)

589-Q. Note on the Brittle Intergranular Fracture of Beta-Brass. S. Harper. *Journal of the Institute of Metals,* v. 85, May 1957, p. 415-416.

Stress concentrations at grain boundaries in conjunction with a rapid rate of straining are shown to be essential factors in causing intercrystalline failure at high temperatures. 6 ref.
(Q26s, M27f; Cu-n)

590-Q. Behaviour of Fractured Copper Fatigue Specimens on Annealing. D. S. Kemsley. *Journal of the Institute of Metals,* v. 85, May 1957, p. 417-420.

Specimens covering a considerable portion of the S/N diagram were annealed at constant temperature and heating rate. Hardness, metallographic and X-ray diffraction observations were made at certain stages during annealing. Explanation of results. 15 ref. (Q7, J23; Cu)

591-Q. Crack Paths in Fatigued Copper. D. S. Kemsley. *Journal of the Institute of Metals,* v. 85, May 1957, p. 420-421.

Study of transcrystalline and intercrystalline fatigue cracks on rotating-cantilever fatigue specimens of high-conductivity copper (99.95%) 10 ref. (Q7, 1-10; Cu)

592-Q. Effects of Solid Solution Alloying on Creep Deformation of Aluminum. Gordon D. Gemmell and Nicholas J. Grant. *Journal of Metals,* v. 9, *AIME Transactions,* v. 209, Apr. 1957, p. 417-423.

Effect of solid solution alloying on creep-rupture properties, deformation characteristics, ductility and fracture of pure aluminum. Study by means of creep-rupture tests of aluminum alloy containing copper, zinc or magnesium heated to 500, 700 and 900° F. 10 ref.
(Q3m, Q23, 1-10; Al)

593-Q. Strain Induced Transformation in Beta Brass. T. B. Massalski and C. S. Barrett. *Journal of Metals,* v. 9, *AIME Transactions,* v. 209, Apr. 1957, p. 455-461.

X-ray and metallographic study of transformation of beta phase of copper-zinc and copper-zinc-gallium alloys upon cold working at low temperatures. Data on new structures formed, on densities of stacking

faults, temperature range on which transformation can be induced and on tendency to revert. 20 ref. (Q24m; Cu-n, Zn, Ga)

594-Q. Crack Propagation in the Hydrogen-Induced Brittle Fracture of Steel. W. J. Barnett and A. R. Troiano. *Journal of Metals,* v. 9, *AIME Transactions,* v. 209, Apr. 1957, p. 486-494.

Mechanism of static fatigue fracture investigated with SAE-AISI 4340 steel heat treated to various strength levels with hydrogen introduced by cathodic charging. Placed under static stress and crack growth and propagation studied by heat tinting, metallographic sectioning and electrical resistance measurements. (Q26s, Q7; AY)

595-Q. Deformation of Magnesium Single Crystals by Nonbasal Slip. Robert E. Reed-Hill and William D. Robertson. *Journal of Metals,* v. 9, *AIME Transactions,* v. 209, Apr. 1957, p. 496-502.

Magnesium single crystal oriented to suppress basal slip and twinning strained in tension parallel to basal plane at 190, 25, 150 and 286° C. and at two strain rates; determined and analyzed yield stresses at the four temperatures; microscopic and X-ray analyses used to determine primary modes of slip.
(Q24a; Mg, 14-11)

596-Q. Effect of Temperature on the Flow Stress and Strain-Hardening Coefficient of Magnesium Single Crystals. Hans Conrad and W. D. Robertson. *Journal of Metals,* v. 9, *AIME Transactions,* v. 209, Apr. 1957, p. 503-512.

Determines stress-strain curves for magnesium single crystals by incremental tensile creep test in temperature range of 78 to 364° K. and direct shear test at 298 and 364° K. Develops expression from data relating strain rate to applied stress, temperature, activation energy and strain hardening coefficent. 39 ref. (Q25n; Mg, 14-11)

597-Q. Comparison of the Strength of Sintered Carbides. Joseph Gurland. *Journal of Metals,* v. 9, *AIME Transactions,* v. 209, Apr. 1957, p. 512-513.

Note on traverse rupture strength, hardness and density of sintered compacts of carbide with cobalt added. Includes tungsten carbide, titanium carbide, tantalum carbide, columbium carbide, vanadium carbide and zirconium carbide.
(Q27a, Q29n, P10a; W, Ti, Ta, Cb, V, Zr, 6-19)

598-Q. HM21XAT8 — New High Temperature Magnesium-Thorium Alloy. *Light Metal Age,* v. 15, Apr. 1957, p. 24-26.

Data on stress-strain relationship in longitudinal and transverse directions, creep properties at elevated temperatures, forming and drawing properties, weldability and corrosion resistance for sheet material of magnesium-thorium alloy. (Q general, K9s, R general, 1-12; Mg, *Th*)

599-Q. Hardness-Tensile Relationships for High Strength Aluminum Alloys. R. E. Kleint and G. B. Mathers. *Light Metal Age,* v. 15, Apr. 1957, p. 30-35.

Data on relationship of tensile strength of 7075 aluminum alloy with hardness values by Rockwell, Riehle, Brinell, Magnatest, Ernst and Barcol tests on "over-age" specimens; comparison of these values with those obtained on specimens with "quench delay" heat treatment. (Q29, Q27, 2-14; Al, SGB-a)

600-Q. Accurate Measurement of Wear Scars on Cutting Tools. J. Taylor. *Machinery,* v. 90, Apr. 26, 1957, p. 927-934.

Methods of measuring machine tool wear with particular reference to methods for wear measurements by microscopes; description of wear scar planimeter and examples of data obtained with it.
(Q9n, 1-4, T6n)

601-Q. Flakes in Alloy Steel. F. Feeg. *Metal Treatment and Drop Forging,* v. 24, May 1957, p. 201-204. (Translation from *Radex-Rundschau,* no. 1, 1957.)

Role of hydrogen in formation of flakes or hairline cracks and methods of prevention.
(Q26; AY, *H,* 9-20)

602-Q. Further Developments in the Precision Measurement of Diamond Indentors for Rockwell Hardness Testing. F. R. Tolmon and Joyce F. Hall. *Microtecnic,* v. 11, no. 1, 1957, p. 36-46.

How the geometrical form of diamond indentors used in Rockwell hardness testing is examined at the National Physical Laboratory to a high degree of accuracy, mainly by

the use of interferometry. Illustrations show that the form of an indentor, including its surface finish, is closely reproduced in the indentation. 1 ref. (Q19c, 1-3, S15)

603-Q. Metallography of a Medium Carbon Steel Subjected to Slow and Impact Compression. J. D. Campbell, J. Duby and K. E. Puttick. *Philosophical Magazine,* v. 2, 8th Ser., Apr. 1957, p. 548-553.

Specimens of medium-carbon steel subjected to slow and dynamic compression examined by optical and electron microscopy; in slow deformation, coarse slip in ferrite occurs in very narrow regions on corrugated surfaces; this behavior appears to be related to the presence of an aging precipitate. 7 ref. (Q24a, M27; CN)

604-Q. Hardness Traverses on Fractured Copper Rotating Cantilever Fatigue Specimens. D. S. Kemsley. *Australian Aeronautical Research Laboratories,* Report ARL/MET. 19, Nov. 1956, 10 p.

In general, the hardness did not rise continuously from each end of the specimen to the point of maximum stress, as expected, but increased to two maxima on either side of this point, and then decreased in the vicinity of the fracture. The extent of this decrease depended on stress and frequency of testing. The hardness at fracture of all specimens fell within a relatively narrow range. 11 ref. (Q29c; Cu)

605-Q. On the Nature of Temper Brittleness in Pearlitic Steels. V. I. Prosvirin and E. I. Kvashnina. *Henry Brutcher Translation* No. 3732, 6 p. (From *Metallovedenie I Obrabotka Metallov,* v. 2, no. 2, 1956, p. 34-49.) Henry Brutcher, Altadena, Calif.

Previously abstracted from original. See item 422-Q, 1956. (Q26s, Q22, J29, AY)

606-Q. Hot Strength High-Chromium Steels for Service at 550-600° C. (1020-1110° F.). L. Ya. Liberman and A. V. Boeva. *Henry Brutcher Translation* No. 3811, 10 p. (From *Metallovedenie I Obrabotka Metallov,* v. 2, no. 6, 1956, p. 16-25.) Henry Brutcher, Altadena, Calif.

Previously abstracted from original. See item 868-Q, 1956. (Q general, J general, M27; SS)

607-Q. Effect of Residual Stresses Upon the Fatigue Strength of Shafts Carrying Tight Sleeves. I. V. Kudryavtsev and N. M. Savvina. *Henry Brutcher Translation* No. 3847, 7 p. (From *Metallovedenie I Obrabotka Metallov,* v. 1, no. 5, 1955, p. 17-23.) Henry Brutcher, Altadena, Calif.

Previously abstracted from original. See item 218-Q, 1956. (Q7, Q25, J28; ST)

608-Q. Elimination of High Brittleness From Hot-Rolled Transformer Sheet. V. A. Koroleva and M. I. Sherstyuk. *Henry Brutcher Translation* No. 3848, 4 p. (From *Stal',* v. 16, no. 6, 1956, p. 545-548.) Henry Brutcher, Altadena, Calif.

Previously abstracted from original. See item 788-Q, 1956. (Q26s, N8, J23; SGA-p)

609-Q. Influence of Some Alloying Elements on the Susceptibility of Steel to Temper Embrittlement. M. L. Bernshtein. *Henry Brutcher Translation* No. 3855, 6 p. (From *Metallovedenie I Obrabotka Metallov,* v. 2, no. 9, 1956, p. 25-30.) Henry Brutcher, Altadena, Calif.

Previously abstracted from original. See item 1047-Q, 1956. (Q26s; ST)

610-Q. Measurement of Residual Stresses in Railroad Car Wheels. H. Bühler. *Henry Brutcher Translation* No. 3859, 8 p. (From *Eisenbahntechnische Rundschau,* v. 5, no. 7, 1956, p. 281-288.) Henry Brutcher, Altadena, Calif.

Application of boring-out and turning method for recording the changes in the stress state brought about by dimensional changes of wheels during actual service; disappearance of radial stresses in wheels and coming-off of tires even under normal loads. Composition, mechanical properties and surface roughness of various parts of wheels. Applicability of method to effects of hardening of wheel flanges. (Q25h, T23p; ST)

611-Q. Reagents for Evaluating Susceptibility to Temper Brittleness in Steel. F. M. del Corral and J. M. B. de Castro y Mosquera. *Henry Brutcher Translation* No. 3878, 3 p. (From *Instituto Del Hierro Y Del Acero,* v. 9, Special No. 45, Apr. 1956, p. 478-480.) Henry Brutcher, Altadena, Calif.

Previously abstracted from original. See item 724-Q, 1956. (Q26s, M21, ST)

612-Q. Fatigue Strength of Steel Plates With Welded-On Inserts. I. V. Kudryavtsev and N. A. Balabanov. *Henry Brutcher Translation* No. 3894, 5 p. (From *Svarochnoe Proizvodstvo,* no. 6, June 1956, p. 1-5.) Henry Brutcher, Altadena, Calif.

Previously abstracted from original. See item 717-Q, 1956.
(Q7, J23; ST)

613-Q. Method of Recording True Stress (Strain) Diagrams at Elevated Temperatures. V. V. Merekina. *Henry Brutcher Translation* No. 3915, 2 p. (From *Zavodskaya Laboratoriya,* v. 22, no. 12, 1956, p. 1491-1492.) Henry Brutcher, Altadena, Calif.

Determination of true stresses at elevated temperatures by testing a series of specimens, the first of them taken to failure and the rest only to certain strains; example of a true stress-strain diagram recorded on a ductile alloy at 68 and 390° F.
(Q25n, 2-13, 1-4)

614-Q. Effect of Hydrogen on the Mechanical Properties of Steel. P. V. Skuev, L. I. Kvater and V. E. Shapiro. *Henry Brutcher Translation* No. 3931, 7 p. (From *Stal',* v. 16, no. 10, 1956, p. 909-915.) Henry Brutcher, Altadena, Calif.

Behavior (especially diffusion) of hydrogen present in steel as a solid solution, in molecular form, and probably as compounds, and its effect on reduction of area, elongation and impact values. Effect of aging time and steel structure on hydrogen content and ductility. Effect of plastic deformation; embrittling action of hydrogen as a factor in flaking, with specific reference to the heat treatment of large forgings.
(Q general, 1-10; ST, *H*)

615-Q. (English.) **On the Mechanism of the Internal Friction Peaks Associated With the Stress-Induced Diffusion of Carbon in Face-Centered Cubic Alloy Steels.** Ke T'ing-Sui and Tsien Chih-Tsiang. *Scientia Sinica,* v. 5, Dec. 1956, p. 625-643.

Internal friction peaks associated with the stress-induced diffusion of carbon were observed in four kinds of face-centered cubic manganese steel which contain 18.5, 25.4, 36.0 and 9.5% (with 8% of Ni and 3% of Cr) of Mn respectively. The optimum internal friction occurs at a temperature around 250° C. when the frequency of vibration is about 2 cycles per sec. Experimental results showed that the height of internal friction peak is linear with the carbon content in solid solution. 13 ref. (Q22, N1; AY)

616-Q. (English.) **Internal Friction Peak Associated With the Stress-Induced Diffusion of Carbon in Low-Carbon Alloy Martensite.** Ke T'ing-sui and Ma Ying-Liang. *Scientia Sinica,* v. 6, Feb. 1957, p. 81-90.

Internal friction in hardened low-carbon nickel steel was measured with a torsion pendulum and an internal friction peak was observed around 155° C. with a frequency of vibration of about 2 cycles per sec. The condition for the appearance of this internal friction peak is that the steel specimens contain martensite, alloying element and carbon. 9 ref. (Q22, N1; AY, *Ni, C*)

617-Q. (French.) **Contribution to the Study of the Mechanical Characteristics of Unalloyed Gray Iron With Laminated Graphite.** Michel Ferry. *Fonderie,* no. 136, May 1957, p. 209-224.

Influence of the matrix and graphite on density, hardness, modulus of elasticity and tensile strength. Practical effects of chemical composition, thickness of the pieces, cooling rates and temperature of casting on the same mechanical characteristics. 27 ref.
(Q general, E11; CI)

618-Q. (French.) **Errors in Reading Diameters in the Brinell Hardness Test.** C. Chaussin. *Metallurgie et la Construction Mecanique,* v. 89, May 1957, p. 477.

The Brinell test is open to two main errors: one as to the diameter of the imprint, the other as to that of the ball. The influence of the latter is comparatively small.
(Q29b, 1-4)

619-Q. (French.) **Reduction of the Coefficient of Friction by Means of Molybdenum Disulphide.** Pierre Bessiere. *Metaux-Corrosion Industries,* v. 32, Apr. 1957, p. 149-161.

Properties and uses of molybdenum disulphide as a lubricant under varying conditions of speed, pressure and temperature and in association with phosphated surfaces; factors influencing friction and wear with solid lubricants; use of molybdenum disulphide as anticorrosive lubricant; consideration of further applications. 42 ref. (Q9p; NM-h)

620-Q. (German.) **Cross Slip in Copper.** Guido Bassi. *Zeitschrift für*

Metallkunde, v. 48, Apr. 1957, p. 190-192.

Spectroscopically pure copper was slightly compressed and annealed at 200° C. for long periods. It was found that cross slip increased with the number of cycles and became irregular. This is thought to be due to the increasing number of vacancies. (Q24a; Cu)

621-Q. (German.) **Deformation of Copper Single Crystals by a Combination of Tension and Torsion.** Hans Rebstock. *Zeitschrift für Metallkunde,* v. 48, Apr. 1957, p. 206-219.

Experiments on copper crystals were carried out to check the dislocation mechanism proposed for the three stages of the stress-strain curve of cubic face-centered crystals. The assumed influence of latent slip systems during Stage 2 was tested in particular by an investigation of the effect of an intermediate torsion of single crystal tubes on work hardening and slip lines. The results agree with the theory that during Stage 2 the activity of latent slip systems creates obstacles which impede slip in the main system by an elastic interaction. Effects in Stage 3 can be understood on the basis of cross slip of screw dislocations. 54 ref. (Q24; Cu, 14-11)

622-Q. (Japanese.) **On the Fracture of Metals (1st Report).** Masui Uemura. *Japan Society of Mechanical Engineers, Transactions,* v. 23, Mar. 1957, p. 142-147.

A phenomenological fracture hypothesis is presented on the premise that generally two fracture stress surfaces for ductile shear fracture and brittle tension fracture in metals exist. The two major factors, triaxiality of stress and plastic strain up to fracture, are formulated into this criterion using the linear invariant of stresses and quadratic invariant of strains respectively. 25 ref. (Q26r)

623-Q. (Japanese.) **On the Erichsen Test of Metallic Sheets—When Narrow Specimens Are Used.** Takeo Yoshizawa. *Japan Society of Mechanical Engineers, Transactions,* v. 23, Mar. 1957, p. 225-229.

The Erichsen test using narrow specimens (less than 70 mm. wide) was made to determine the accuracy of Erichsen value. (Q23q, 1-4; 4-3)

624-Q. (Japanese.) **Stress Distribution and Friction Coefficient in Cold Rolling of Aluminum Plates.** Jiro Wada, Masanobu Sasagawa and Kengo Nakamura. *Light Metals,* v. 7, Mar. 1957, p. 11-15.

A new apparatus for measuring stress distribution and dynamic friction coefficient in cold rolling of aluminum plates consists of a small tungsten pin which is set along the radius direction of the under roll, and a wire strain gage which changes with deformation of the small pin. The wire strain gage is sufficiently sensitive for a small load, as the bobbin of the gage is made of bakelite cloth. With the apparatus a series of experiments was carried out to clarify rolling stress distribution, stick-slip and dynamic friction coefficient in cold rolling of aluminum plates.
(Q25, 1-3, F23, 1-17; Al)

625-Q. (Japanese.) **Report on Mechanical Properties of Duralumin Preserved for a Long Period.** Hiroshi Asada, Jiro Wada and Yasuhiro Horiguchi. *Light Metals,* v. 7, Mar. 1957, p. 37-43.

The test pieces were preserved in a basement storage room until 1934 without any protection; since then they have been preserved in a steel locker in an ordinary room. After 28 years, tensile strength has become more or less lower and elongation more or less higher. (Q27a; Al)

626-Q. Static Properties of Several High-Strength Steels. E. P. Klier, B. B. Muvdi and G. Sachs. *American Society for Testing Materials,* Preprint 68, 1957, 14 p.

Investigation of the notch properties of high-strength steels. These depend on the following factors: (*a*) strength level, (*b*) orientation, (*c*) composition, (*d*) eccentricity of the load, (*e*) section size and (*f*) stress concentration. 13 ref.
(Q23s; ST, SGB-a)

627-Q. Tensile and Creep Properties of Tungsten at Elevated Temperatures. J. W. Pugh. *American Society for Testing Materials,* Preprint 71, 1957, 10 p.

Tungsten has been shown to be stronger than other representative refractory metals in short-time tension tests from room temperature to 2000° F. The margin of its superiority in this respect is proportional to its higher melting point. 9 ref. (Q27a, Q3m, 2-12; W)

628-Q. Determination of Strain-Hardening Characteristics by Torsion

Testing. D. S. Fields and W. A. Backofen. *American Society for Testing Materials,* Preprint 84, 1957, 13 p.

The conventional analysis of plastic torsion in a cylindrical specimen has been generalized to include rate-sensitive materials. 9 ref.
(Q1, N7e)

629-Q. Effect of Cold Work on Elevated Temperature Properties of Types 301, 305, and 310 Stainless Steels. R. A. Lula, A. J. Lena and H. M. Johnson. *American Society of Mechanical Engineers Transactions,* v. 79, May 1957, p. 921-926.

Elevated-temperature strength of AISI Types 301, 305 and 310 stainless steels can be improved by cold working, provided extensive recrystallization during exposure does not take place.
(Q27a, 2-12, 3-18; SS)

630-Q. Improving Titanium Wear. H. A. Pray, P. D. Miller and R. Jeffery. *Battelle Technical Review,* v. 6, June 1957, p. 14. (CMA)

The galling tendency of titanium and titanium alloys was reduced by producing a conversion coat with immersion baths containing 50 g. per l. of Na_3PO_4 and 20 g. per l. KF in hydrofluoric acid of differing concentrations. The more acidic baths give coats that are better at 25° C. An anodic coating produced from a NaOH bath is also very good. These coats are removable on pickling with HNO_3-HF baths. The highly wear resistant coats produced by heat treating at 800° F. are more difficult to remove.
(Q9n, L14b; Ti)

631-Q. Cast Iron Tests and Specifications. *British Foundryman,* v. 50, Mar. 1957, p. 131-142.

Tensile tests studied and attempts made to overcome difficulties arising from effect of section thickness on strength; for transverse tests, recommends higher scale of loading tests and considerable modification of the deflection figures. 8 ref.
(Q27, 1-4; CI)

632-Q. Some Features of the Metallurgical Properties of Steel Castings. W. J. Jackson. *British Foundryman,* v. 50, Apr. 1957, p. 211-219.

Effect on ductility of cast steel of sulphur, phosphorus, nonmetallic inclusions, dendritic segregation and microporosity; influence of chemical composition and heat treatment on low-temperature impact properties. 25 ref.
(Q23p, Q6n, 2-13, 2-10; ST, 5)

633-Q. Detection of Fatigue in Metals. R. F. Hanstock. *British Journal of Applied Physics,* Supplement No. 6, Physics of Non-Destructive Testing 1957, p. S48-S50.

Brief review of fatigue and methods employed or suggested for examining its development. Primary consideration is the assessment of the potential value of these methods as primitive nondestructive tests to reveal fatigue prior to development of serious structural weakness. 13 ref. (Q7, 1-4)

634-Q. Structural Changes and Energy Dissipation During Fatigue in Copper. N. Thompson and N. J. Wadsworth. *British Journal of Applied Physics,* Supplement No. 6, Physics of Non-Destructive Testing 1957, p. S51-S55.

Apparatus and methods used and summary of results of observations made of metallographic and energy dissipation changes occurring during fatigue testing of fully annealed copper. 5 ref. (Q7, 1-3; Cu)

635-Q. Average Mechanical Properties of Steel. H. A. Magnus. *Design News,* v. 12, May 15, 1957, p. 140.

Chart for comparing Rockwell, Brinell, ultimate tensile and yield strength relationships.
(Q29n, Q27a, Q23b; ST)

636-Q. Characteristics of Stainless Steels. *Design News,* v. 12, May 15, 1957, p. 141-153.

A "selector chart" intended as a guide in choosing stainless steels.
(Q general, S22; SS)

637-Q. Effect of Section Thickness and Microstructure on AZ 91 Magnesium Castings. John K. Dietz. *Foundry,* v. 85, May 1957, p. 171-173.

Study of effect of microstructure and section thickness on tensile properties. Notes variation of properties with heat treatment; plots tensile properties as a function of percentage of pearlitic precipitation and as function of grain size.
(Q27a, 2-9, 3-21; Mg, 5)

638-Q. Mechanism of Fatigue Failure in Some Binary and Ternary Aluminium Alloys. P. J. E. Forsyth and C. A. Stubbington. *Institute of Metals Journal,* v. 85, Mar. 1957, p. 339-343. 9 ref.

Metallographic observations of fatigue process in a number of simple aluminum alloys at room, low and elevated temperatures. Process appears to be one of depletion

of solute atoms in localized region under action of cyclic stresses. Subsequent plastic deformation concentrated in soft spots in structure produced by depletion. (Q7, M27; Al)

639-Q. Effect of Neutron Irradiation on the Mechanical Properties of Titanium and Zirconium. M. J. Makin and F. J. Minter. *Institute of Metals Journal*, v. 85, May 1957, p. 397-402. (CMA)

Changes in the mechanical properties of neutron-irradiated titanium were an increase in yield stress (by about 8000 psi., at all temperatures within the −195-200° C. range), reduction of the elongation before fracture, and a slightly increased ultimate tensile strength. In irradiated zirconium the yield stress of heavily cold worked zirconium decreased slightly, and the elongation and ultimate tensile strength increased. (Q23b, Q27a, 2-17; Ti, Zr)

640-Q. Frequency Dependence of Ultrasonic Attenuation and Velocity on Plastic Deformation. Akira Hikata and Rohn Truell. *Journal of Applied Physics*, v. 28, May 1957, p. 522-523.

Dependence of ultrasonic attenuation and velocity on plastic deformation in 2S aluminum is compared at two frequencies, 5 and 10 megacycles, and the comparison shows agreement as regards frequency dependence with what one can expect from dislocation damping theory. (Q24, Q22; Al)

641-Q. Tin Is Not a Subversive Element in Gray Iron. J. A. Davis, D. E. Krause and H. W. Lowne. *Modern Castings*, v. 31, May 1957, p. 96-98.

Effect of tin additions on the mechanical properties and microstructures of hypo-eutectic and hypereutectic cast gray iron. Tin additions acted as stabilizer of pearlite and slightly improved mechanical properties with tin content up to 0.10%.
(Q general, M27, 2-10; CI-n, *Sn*)

642-Q. Creep and High Temperature Alloys. R. W. Guard. *Steel*, v. 140, May 22, 1957, p. 108-118.

General picture of creep behavior; balancing of alloy composition to obtain right amount of dispersed phase in grain boundaries, dispersed or precipitated particles within grains themselves and proper solid solution strengthening.
(Q3m, M27d; SGA-h)

643-Q. Properties of Large Steel Forgings. Edward A. Loria. *Steel Processing and Conversion*, v. 43, Apr. 1957, p. 193-198.

Transverse mechanical properties of large steel forgings; their relation to ingot size, forging reduction, transverse reduction of area and original ingot heterogeneities such as dendrite patterns, banding and nonmetallic inclusions. 12 ref.
(Q general; ST, 4-1, 9-19)

644-Q. (Czech.) **Influence of Some Factors on the Relaxation in Material at Elevated Temperatures.** Lubomir Cizek. *Hutnické Listy*, v. 12, Apr. 1957, p. 335-342.

The temperature and the initial stress have the most pronounced influence on relaxation; examines, by the relaxation bending method, the influence of some surface layers formed by the diffusion process on the same size chromium-tungsten-vanadium rings.
(Q3m, 2-12, Ni; Cr, W, V)

645-Q. (French.) **Better Resistance to Wear by Improving Friction Characteristics.** *Pratique des Industries Mecaniques*, v. 40, Feb. 1957, p. 51-53.

Improvement of geometry of surface condition; "internal" or chemical transformation of surface condition; lubrication. (Q9p, 18-23)

646-Q. (German.) **Influence of Sub-Zero Temperatures and Notches on Static Strengths of Welded Aluminium Alloy Sheet.** F. Erdmann Jenitzer. *Aluminium*, v. 33, June 1957, p. 376-384.

Use of aluminum for making storage and transport tanks for liquid oxygen requires exact information about the mechanical properties of Al-Mg alloys, of good welding properties, at temperatures down to that of liquid air (−183° C.). Results of investigations of static strengths of 1.5-mm. thick (1/16-in.) oxy-acetylene butt welded sheets in Al-Mg 5, Al-Mg-Mn, and two $Al\text{-}Mg_2Si$ alloys, which are noted for their ability to be welded crack-free in small thicknesses. An alloy containing 3% magnesium, 0.65% silicon, 0.62% manganese, 0.35% iron, 0.05% copper proved particularly suitable.
(Q27a, K9s; Al)

647-Q. (Russian.) **Influence of High Temperature and Introduction of Magnesium on the Properties of Cast Iron Containing Spheroidal Graphite.** E. E. Farafonov and M. S. Kolmakova.

Liteinoe Proizvodstvo, no. 3, Mar. 1957, p. 14-16

Laboratory observations on the change of mechanical characteristics with diminishing temperature and assimilation of magnesium. Reduction in the quantity and size of graphite inclusions, and increase of pearlitic inclusions were noted.
(Q general; CI-r, Mg, AD-p, 9-19)

648-Q. Yield Phenomenon in Face-Centered Cubic Single Crystals. P. Haasen and A. Kelly. *Acta Metallurgica,* v. 5, Apr. 1957, p. 192-199.

Experiments and correlation with other workers on yield point in the stress-strain curves of single crystals of pure aluminum and nickel.
(Q25n; Al, Ni, 14-11)

649-Q. Reports on Fatigue Failures. International Institute of Welding. Commission 13: Fatigue Testing. *British Welding Journal,* v. 4, May 1957, p. 231-238.

Examples of fatigue failures occurring in service in welded constructions with information as to nature and type of weld, weld dimensions and process of fracture in axle arm of washing machine, front axle of truck, welded press frame and stainless steel mixture arm.
(Q7b; ST, 7-1)

650-Q. Torsion-Testing Machine for Spot Welds. T. M. Roberts. *British Welding Journal,* v. 4, May 1957, p. 243-245.

Power-operated testing machine produces continuous graphical record of torque load and angular deflection from commencement of loading to failure of specimen.
(Q1, 1-2; 7-1)

651-Q. Effect of Calcium Cyanamide on Alloy Cast Irons. Chuyo Hisatsune, Akira Shimizu and Yoshisada Ueda. *Casting Institute of Japan, Journal,* v. 29, Mar. 1957, p. 146-156.

Effect on the mechanical properties with special reference to the tensile strength of alloy cast irons. The tensile strength of alloy cast irons, containing molybdenum, copper or chromium is improved by treatment with calcium cyanamide; strength of alloy cast irons, containing boron, aluminum or titanium, is not increased by the addition of calcium cyanamide; nickel cast irons are little affected by this treatment; on microscopic structures of alloy cast irons, containing molybdenum, copper and chromium, treated with calcium cyanamide, graphite flakes are shorter and pearlite is finer than those of untreated irons. 12 ref.
(Q27a; CI-q, AD-p37)

652-Q. Impact Testing of Hard Metals. W. Spaeth. *Industrial Diamond Review,* v. 17, Apr. 1957, p. 65-68, 70.

A new impact tester has been developed which measures not only the energy absorbed by the test piece but also the ultimate load reached during the test. This instrument has been used for numerous tests on a wide range of materials, such as plastics, natural and synthetic carbon, ceramic materials. 5 ref. (Q6, 1-3)

653-Q. Effect of Alloying Elements on Tensile Strength. J. Glen. *Iron and Steel,* v. 30, June 8, 1957, p. 295-312. (CMA)

True stress-strain tensile measurements were performed over a range of temperatures to determine the effect of a number of alloying additions on steel. Adding enough vanadium or titanium suppresses the strain-aging phenomenon at 200° C. since interstitial carbon or nitrogen are firmly fixed adjacent to the vanadium or titanium atoms. A stress maximum was obtained at 400-500° C., and this is considered unusual. Molybdenum has very little effect on the strain-aging phenomenon at 200° C., even allowing for the greater atomic weight. The possibility of molybdenum increasing the solubility of carbon and nitrogen is noted. (Q27a, 2-10, N7e; ST)

654-Q. Microhardness Penetration Curves in Two Nickel-Bearing Carburized Steels. Henry M. Otte. *Iron and Steel Institute, Journal,* v. 186, May 1957, p. 13-21.

Studies made on two pack-carburized air cooled or water quenched nickel-bearing steels with a diamond pyramid microhardness tester of variation in hardness with depth; values obtained related to amount of retained austenite and carbon content; microhardness values found were equivalent to those obtained with standard tester. 20 ref.
(Q29q, 2-14; AY, *Ni*)

655-Q. Effect of Alloying Elements on the High-Temperature Tensile Strength of Normalized Low-Carbon Steel. J. Glen. *Iron and Steel Institute, Journal,* v. 186, May 1957, p. 21-48.

Study of the effect of individual alloying elements in steels made with and without aluminum additions; elements investigated include manganese, chromium, molybdenum, tungsten, vanadium, titanium, silicon, nickel and copper. 18 ref. (Q27a, 2-12, 2-10; CN, AY)

656-Q. Contribution to the Study of Anomalies in the Internal Friction of Iron Due to the Presence of Nitrogen in Solution. L. Guillet and P. Gence. *Iron and Steel Institute, Journal,* v. 186, June 1957, p. 223-226.

Behavior of a low-carbon steel when subjected to cyclic stresses at various temperatures is studied. Peak values of internal friction are related to resonant oscillation of nitrogen atoms in the alpha-iron lattice. Critical temperatures for maxima in internal friction at frequencies from 322 to 15,000 cycles per sec. determined. Comparison made between calculated and experimental values of relaxation time for range of temperature studied. 8 ref. (Q22; CN, *N*)

657-Q. Friction in Cold Rolling. G. T. van Rooyen and W. A. Backofen. *Iron and Steel Institute, Journal,* v. 186, June 1957, p. 235-244.

Experiments were carried out in a two-high mill with 6-in. diam. by 10-in. long hardened steel rolls operating at 25 ft. per min.; test material was 2S-18H aluminum. Coefficient of friction along arc of contact was determined using a roll containing two small pins installed at right angles to roll axis, one in a radial direction, the other inclined to the first in an oblique direction. From ratio of stress in the oblique and radial directions, coefficient of friction could be computed as a function of position in the roll gap. Further data about friction over contact arc were derived from distortion of a fine grid machined on strip surface prior to rolling. 17 ref. (Q9p, F23, 1-17)

658-Q. Effect of Ordering on the Slip Patterns of Deformed Ni_3Mn Alloy. Tadami Taoka and Ryukichi Honda. *Journal of Electron Microscopy,* v. 5, (Annual Edition) 1957, p. 19-22.

An essential difference between slip patterns in an ordered state and that in a disordered state of Ni_3Mn alloy was observed, namely an elementary structure in the former with the usual coarse slip in the latter, as in the case of Cu_3Au alloy. The two types of slip patterns indicate two different mechanisms of plastic deformation, in the different states of order in these alloys. 7 ref. (Q24a, N10; Ni, Mn)

659-Q. Prot Fatigue Study of an Aircraft Steel in the Ultra High Strength Range. P. W. Ramsey and D. P. Kedzie. *Journal of Metals,* v. 9, *AIME Transactions,* v. 209, Apr. 1957, p. 401-406.

Determines the relationship between fatigue and tensile properties using the Prot progressively increasing load method for a nickel-chromium - molybdenum - vanadium steel in the 150 to 280 ksi. tensile strength range. Comparison with conventional fatigue tests and study of hardness, microstructure and inclusions. 10 ref. (Q7e, Q27a; AY)

660-Q. Nucleation of Dislocation Loops by Cracks in Crystals. J. J. Gilman. *Journal of Metals,* v. 9, *AIME Transactions,* v. 209, Apr. 1957, p. 449-454.

Observes etched pits produced by chemical reagents at dislocations in lithium fluoride in positions in front of cleavage cracks as it passes through crystal. Finds that dislocation loops are nucleated ahead of slowly moving cleavage cracks in dislocation-free regions. Studies stability of loops at room and higher temperatures and under stress. 14 ref. (Q26n, M26b, N2)

661-Q. Cleavage Steps and the Cleavage Plane in Chemically Embrittled Cu_3Au Single Crystals. Robert Bakish. *Journal of Metals,* v. 9, *AIME Transactions,* v. 209, Apr. 1957, p. 494-495.

Note on brittle behavior and appearance of cleavage face upon bending of embrittled Cu_3Au crystals normal to (110) plane. (Q26n, Q26s; Cu, Au, 14-11)

662-Q. Effect of Strain and Temperature on the Yielding of Copper and Nickel. J. H. Frye, J. L. Scott and J. W. Woods. *Journal of Metals,* v. 9, *AIME Transactions,* v. 209, May 1957, p. 708.

Tensile tests with copper and nickel specimens show linear relationship between yield stress and temperature when internal structure remains constant. 9 ref. (Q27, Q23b, 2-11, 3-18; Cu, Ni)

663-Q. New Ultra High Strength Steel. Samuel J. Rosenberg and

Carolyn R. Irish. *Materials and Methods,* v. 45, May 1957, p. 145-146.

Mechanical properties of a high silicon-titanium modification of 4340 steel which retains ductility for structural applications when heat treated to 285,000 psi.
(Q general; AY, SGB-a; AY)

664-Q. Aluminum-Tin Bearings — High Tin Types Reduce Wear. E. C. Ellwood. *Materials and Methods,* v. 45, June 1957, p. 110-113.

Mechanical properties of aluminum-tin alloys and the effect of small copper additions and heat treatment on them; structure, fatigue and wearing properties; methods of bonding aluminum-tin alloys to steel. 7 ref.
(Q9n, Q7a, 2-10, L22; SGA-c, Al, Sn)

665-Q. How to Distinguish Brittle From Tough Steel. Herman Greenberg. *Metal Progress,* v. 71, June 1957, p. 75-81.

To insure freedom from brittle failure in service, steel should have a "nil-ductility transition (NDT) temperature" below its minimum working temperature. At temperatures below NDT, samples with a sharp notch break with all-cleavage fracture. (Q23r, Q26s, 1-4; ST)

666-Q. Aircraft Alloys for Thermal Flight up to 1200° F. Over-All Statement of the Problem. Alfred H. Petersen. *Metal Progress,* v. 71, June 1957, p. 97-98.

Predictions based on 40 years history indicate that 1970 aircraft will require an "index"—that is, yield strength divided by density—of 800,000 at 1200° F. The job ahead of metallurgists is indicated by the fact that the best of our present "superalloys" reach only about 450,000 index. (Q27a, 2-12, T24; SGA-h)

667-Q. Aircraft Alloys for Thermal Flight up to 1200° F. Metallurigical Requirements. Leo Schapiro. *Metal Progress,* v. 71, June 1957, p. 98-99.

Discussion of the yield strength required for a material operating at 1200° F. and the "index" (strength divided by density).
(Q27a, 2-12, T24; SGA-h)

668-Q. Aircraft Alloys for Thermal Flight up to 1200° F. Material and Processing Requirements. F. R. Kostoch. *Metal Progress,* v. 71, June 1957, p. 100-101.

The forming, heat treating, welding, brazing and corrosion problems of high-strength materials.
(Q27a, G general, 17-2; SGA-h, SGB-a)

669-Q. Aircraft Alloys for Thermal Flight up to 1200° F. Titanium Alloys. Robert I. Jaffee. *Metal Progress,* v. 71, June 1957, p. 101-103.

Description of present titanium alloys for aircraft and developments anticipated. Strength properties and possibility of satisfying the "Schapiro index". (Q27a, 2-12, T24, 17-7; Ti)

670-Q. Aircraft Alloys for Thermal Flight up to 1200° F. Steels for Aircraft. R. B. Gunia. *Metal Progress,* v. 71, June 1957, p. 104-105.

Stainless steel is compared with the ideal aircraft metal, particularly as the strength and the "Schapiro index". (Q27a, 2-12, T24, 17-7; SS)

671-Q. Aircraft Alloys for Thermal Flight up to 1200° F. Tool and Die Steels. George A. Roberts. *Metal Progress,* v. 71, June 1957, p. 106-108.

Basic characteristics of toolsteel, and specific alloys particularly suited to aircraft structural applications.
(Q27a, 2-12, T24, 17-7; TS)

672-Q. Aircraft Alloys for Thermal Flight up to 1200° F. Superalloys for Airframe Structures. F. Sidney Badger. *Metal Progress,* v. 71, June 1957, p. 109-110.

Properties of present superalloys are discussed and possibilities for improvement are considered. Nickel-base types, cobalt-base and iron-base are compared as to "Schapiro index".
(Q27a, 2-12, T24, 17-7; SGA-h, Ni, Co, Fe)

673-Q. Hardness and Its Measurement. Vincent E. Lysaght. *Metal Treating,* v. 8, May-June 1957, p. 2-4, 26-27, 36-39, 42-49.

Definitions and significance of hardness and hardness testing in metallurgy. Discusses Brinell, Rockwell and Diamond Pyramid hardness testing methods; illustrates some new portable and superficial hardness testing machines.
(Q29, 1-3)

674-Q. Use of Radioactive Tracers in the Investigation of Wear of Drop-Forging Dies. D. B. Smith, H. Southan and H. A. Whiteley. *Metal Treatment and Drop Forging,* v. 24, Apr. 1957, p. 131-136.

Experiment using radioactive insert in drop forging die for gaging wear through rubbing away and transfer of material.
(Q9, W22a; 14-13)

675-Q. Radiographic Inspection of the Structure of Lifting Chains. George A. Holmes and R. Pankowski.

Metal Treatment and Drop Forging, v. 24, Apr. 1957, p. 143-148.

Radiospectrographic method used for nondestructive testing of the degree of cold work in wrought iron and mild steel lifting chains. Method demonstrated heterogeneity of cold working and found correlation between structure and mechanical stress and between distribution of cold work and brittle fracture in service. (Q24f, Q26s, S13e)

676-Q. Metallurgical Problems in Nuclear Power Plants. Behaviour of Uranium and Plutonium. J. G. Ball. *Metal Treatment and Drop Forging,* v. 24, Apr. 1957, p. 155-158.

Problems encountered by the physical metallurgist in the use of uranium and plutonium include deformation due to temperature changes, irradiation and fission. The problems are complicated by the existence of numerous and complex phases.
(Q general, M26, W11p, 17-7; U, Pu)

677-Q. Fatigue Properties of Brasses, Bronzes and Bearing Metals. J. W. Cuthbertson. *Metal Treatment and Drop Forging,* v. 24, Apr. 1957, p. 159-161.

Difficulties in assessment of fatigue resistance in bearings. Methods of increasing fatigue resistance in tin-babbitt alloys and fatigue properties of copper-lead, aluminum-tin, special composition and electrodeposited bearings.
(Q7a; Cu, Sn, Al, SGA-c)

678-Q. Can Ultrasonics Speed Fatigue Testing? *Metalworking Production,* v. 101, June 14, 1957, p. 1032.

Experimental high-frequency technique, in process of development by Mullard Research Laboratories, appears to have several advantages over conventional methods, notably drastic reduction of testing time. A difficulty is that fatigue limit is function of frequency, necessitating calibration of machine.
(Q7, 1-3, 1-24)

679-Q. Some Observations on the Nature of Fatigue Damage. P. J. E. Forsyth. *Philosophical Magazine,* v. 2, 8th Ser., Apr. 1957, p. 437-440.

Nature of ship bands at the stage when fatigue cracks are forming. 5 ref. (Q7a, Q24c)

680-Q. High-Temperature Stainless. Edward A. Loria. *Product Engineering,* v. 28, Apr. 1957, p. 135-139.

Pertinent structural data on five austenite-type steels and three martensite alloys of the 400 series usable in applications where 600-1400° F. operating temperatures are encountered. Effects of heat treatment and cold reduction included.
(Q general, 2-12; SS, SGA-h)

681-Q. How Irradiation Affects Aluminum Alloys. H. H. Hausner. *Product Engineering,* v. 28, Apr. 1957, p. 169-171.

Tensile and yield strength increase considerably. Elongation decreases in many cases, with maximum decrease in annealed specimens, minimum decrease in strain-hardened specimens. Without protective film, irradiation may tend to accelerate corrosion; in presence of oxide film irradiation acts as a further inhibitor. (Q27a, R general, 2-17; Al)

682-Q. Today's Hottest Question: Materials for Use Above 1500° F.? *Steel,* v. 140, May 13, 1957, p. 120-122.

Progress in development of alloys with cobalt, nickel or molybdenum base for high-temperature use.
(Q general, 2-12; Co, Ni, Mo, SGA-h)

683-Q. Lubrication. A Study of Its Action in Continuous Metal Deformation. Pt. 1. L. H. Butler. *Steel Processing and Conversion,* v. 43, May 1957, p. 269-275, 285.

Reviews current theories on the mechanism of friction with special emphasis on welding theory concerning aspects of metal transfer and position of shear plane in welded junctions; types of lubricants and theory of lubrication; concept of hydrodynamic, hydrostatic and boundary lubrication; solid lubricants; requirements of lubricant of metal deformation processes. 26 ref. (To be continued.)
(Q9p, G general, F general; NM-h)

684-Q. Evaluation of Weld-Joint Flaws as Reinitiating Points of Brittle Fracture. D. C. Martin, R. S. Ryan and P. J. Rieppel. *Welding Journal,* v. 36, May 1957, p. 244s-251s.

Reviews literature on brittle fracture in ship steels and similar materials. Study was made to determine kind of test specimen and apparatus to use for evaluating weld joint flaws. Influence of lack of fusion and cracking in welds on the initiation of brittle fracture; data on effect of flaw dimensions; test temperatures; residual stresses and cyclic loadings. 8 ref. (Q26s, K9r)

685-Q. Factors Affecting the Tensile Properties of Steel Weld Metal.

C. M. Wayman and R. D. Stout. *Welding Journal,* v. 36, May 1957, p. 252s-262s.

Comprehensive literature review of effect on the mechanical properties of weld metal, of metal structure and defects, alloying elements, welding technique, residual stresses, heating and cooling rates, normalizing or annealing. Discusses effect of molybdenum, manganese, chromium, vanadium, nickel, carbon, nitrogen, oxygen, hydrogen, sulphur and phosphorus. 59 ref. (Q27a, K9r, 2-10; ST)

686-Q. True Stress-Strain Properties of Titanium and Titanium Alloys. E. B. Kula and F. R. Larson. U.S. Watertown Arsenal Laboratory, Report 401/259. *U.S. Office of Technical Services,* PB 121833, Sept. 1955, 90 p. (CMA)

Several heats each of five alpha and six alpha-beta titanium alloys were tested for true stress-strain in the mill-annealed and vacuum-annealed conditions. The test range was −196 to 400° C. Chemical compositions and microstructures studied. (Q25n; Ti)

687-Q. Development of a Heat-Treatable Titanium Alloy Having Adequate Formability. H. A. Robinson, et al. U.S. Air Force, Wright Air Development Center, Technical Report 56-545. *U.S. Office of Technical Services,* PB 121942, Jan. 1957, 78 p. (CMA)

Twenty-seven alpha-beta titanium alloys were melted, forged, rolled to sheet and evaluated for formability and heat treatability as sheet alloys. Solution temperature usually had a greater effect than alloy additions on relative formability (as-quenched). The alloy Ti-3Fe-3Mo-2Al was of particular interest and others showed promise. (Q23q, J general, 17-2; Ti)

688-Q. Investigation of the Effects of Hot-Cold Work on the Properties of Molybdenum Alloys. M. Semchyshen and R. Q. Barr. U.S. Air Force, Wright Air Development Center, Technical Report 56-454. *U.S. Office of Technical Services,* PB 121976, Jan. 1957, 126 p. (CMA)

Mo-0.28Cb and Mo-0.50Ti were studied for fabrication variables vs. degree of strain hardening and vs. resistance to softening at high temperatures. At 2400° F. the columbium alloy was the less strain hardened, due to the greater structure stability of the titanium alloy. High-temperature softening was correlated with as-forged hardness. The anomalous higher hardness with higher working temperature is attributed to strain aging. (Q23a, N7e; Mo)

689-Q. Influence of Hydrogen on Delayed Failure in Titanium Alloys. R. D. Daniels, et al. U.S. Air Force, Wright Air Development Center, Technical Report 57-30. *U.S. Office of Technical Services,* PB 121997, Feb. 1957, 48 p. (CMA)

Notch geometry, strength level, hydrogen concentration and hydrogen distribution appreciably influence the delayed fracture properties of Ti-4Al-4Mn. The hydrogen-induced delayed failure in sharply notched specimens proceeded by the initiation and slow propagation of cracks, with growth being accelerated by increased hydrogen. The rate appeared to be independent of applied stress, but under some stress conditions the room-temperature creep was a complicating factor. High hydrogen concentration promotes early initiation and rates appear to depend on diffusion of hydrogen from the surface. (Q26; Ti, *H*)

690-Q. (English.) **Dispersion in Time Creep Experiments.** W. Stauffer and A. Keller. *Schweizer Archiv,* v. 23, Feb. 1957, p. 43-52.

Long-time creep and time-rupture tests show considerable dispersion owing to testing procedure and the various characteristics of materials tested. A great number of melts have to be submitted to long-time tests to obtain reliable minimum figures. Plotting of all values of creep and time-rupture tests to obtain average and particularly minimum values proved more suitable than evaluation of each melt. 5 ref. (Q3, 1-4)

691-Q. (English.) **Brittle Fracture of Iron and Steel.** N. P. Allen. *Teknisk Ukeblad,* v. 104, May 9, 1957, p. 375-383.

Liability to brittle fracture is to some extent determined by the quality of the steel, and it is necessary to know how to make steels in which the risk of fracture is low, how to insure by tests that the risk is sufficiently low, and what degree of freedom from risk of brittle fracture is necessary in steels intended for structures of various types. 12 ref. (Q26s; Fe, ST)

692-Q. (English.) **Stresses in Rotating Disks With Noncentral Circular Holes.**

Hideo Saito. *Tohoku University, Technology Reports,* v. 21, 1957, p. 217-234.

To check centrifugal stresses of rotating machines, stress concentrations were determined mathematically for aluminum disks containing four and six holes. The radius of the circle on which the centers of the holes were arranged was arbitrarily fixed and the sizes of the holes varied. 6 ref. (Q25, 1-4; Al)

693-Q. (English.) **Measurement of Stresses in Rotating Disks With Holes by Bonded Wire Strain Gages.** Hideo Saito. *Tohoku University, Technology Reports,* v. 21, 1957, p. 235-245.

Electric resistance strain gages with an inexpensive slip ring arrangement were used to measure stress distributions in rotating aluminum disks having symmetrically placed noncentral holes of a variety of sizes, locations and configurations. 14 ref. (Q25, 1-4; Al)

694-Q. (French.) **Electronic Recording of Stress-Time and Stress-Strain Diagrams of Metals Under Impact Stresses.** Julien Dubuc and Georges Welter. *L'Ingenieur,* v. 43, Mar. 1957, p. 31-38.

Stresses were measured by a dynamometer and variable resistance electric strain gages fed by a power supply and a special pentode circuit. Strains were measured by a dynamic extensometer using a photoelectric cell. Results of impact tests showed maximum resistance to be higher than in static tests; and that plastic properties, such as elongation and reduction of area at yield point, increase as compared to static values. 11 ref.
(Q6n, Q27a, X29q, 1-3)

695-Q. (German.) **Alloyed Cylinder Cast Iron.** Hans Reininger. *Giesserei-Praxis,* v. 75, Apr. 25, 1957, p. 168-173.

Influence of the alloying elements nickel, chromium, molybdenum, copper, nitrogen and aluminum, antimony, titanium, vanadium, boron and zinc on alloyed cylinder cast iron. 49 ref. (Q general, 2-10; CI-q)

696-Q. (German.) **Importance of Surface Hardening and Internal Tensions in Structural Steel Section.** Heinrich Standinger. *Metalloberfläche,* v. 11, June 1957, p. 200-205.

Surface strength, increased by heat treatment and mechanical forming, is related to existing internal tensions in structural sections. Generally with such surfaces, internal tensions arise which with proper construction also increase fatigue strength. 30 ref. (Q27a, Q7a, 2-14)

697-Q. (Italian.) **Example of Slip on a Crystalline Plane of Low Atomic Density. M. Paganelli.** *Alluminio,* **v. 26, Apr. 1957, p. 154-156.**

In an artificially aged, moderately deformed 5%Cu-Al alloy, conditions caused by surrounding grains and subgrains formed by previous deformations can promote slipping. 5 ref. (Q24a, M27c; Al, ***Cu*****)**

698-Q. (Italian.) **Influence of Copper Content on Internal Friction in Al-Cu Alloys.** T. Federighi and F. Gatto. *Alluminio,* v. 26, Apr. 1957, p. 157-161.

Experiments on samples taken from extrusions and from cold rolled material showed that even a small quantity (0.25%) of copper causes a noticeable reduction in internal friction, regardless of the purity of the metal and the frequency of vibration of the test piece. In certain cases, a copper content of over 2% causes a slight increase in internal friction. 13 ref.
(Q22, 2-10; Al, *Cu*)

699-Q. (Italian.) **Effect of Cold Working After Quenching on the Natural and Artificial Aging Characteristics of Al-Cu-Mg Alloys.** D. Gualandi and M. Leoni. *Alluminio,* v. 26, May 1957, p. 203-211.

Effects of 0 to 15% cold working were studied. Cold working was found to increase tensile and yield strengths, reduce elongation; to avoid excessive reduction of elongation, degree of cold working should not be more than 10%. 4 ref.
(Q27a, N7e, 3-18; Al)

700-Q. Properties of Cast Iron at Elevated Temperatures. J. R. Kattus. *ASTM Bulletin,* no. 222, May 1957, p. 12.

Preliminary test results of research currently in progress at Southern Research Institute under the sponsorship of the ASME-ASTM Joint Committee on Effect of Temperature on the Properties of Metals.
(Q general, 2-12; CI)

701-Q. Application of a New Structural Index to Compare Titanium Alloys With Other Materials in Airframe Structures. *American Society of Mechanical Engineers, Transactions,* v. 79, July 1957, p. 949-958. (CMA)

The formula is presented which was previously used as the struc-

tural index for evaluating the strength of airframes. The method is unreliable and does not predict failing load. A new formula which overcomes these difficulties is proposed. Results are compared with compression tests for titanium alloy angles and channels at 70° F. and temperatures extending above 900° F. Ti-100, Ti-8Mn, Ti-6Al-4V, Ti-3Al-5Cr, RC-130A and RC-130B are the alloys for which data are graphed and tabulated.
(Q27a, Q28, T24a, 177; Ti)

702-Q. Fatigue, Creep, and Relaxation in Metals. G. R. Gohn. *Bell Laboratories Record,* v. 35, June 1957, p. 201-205.

If the stress conditions are known and can be accurately determined by analysis and from photographic studies, designs can be made that will be relatively free from fatigue failure. Notes on various factors influencing these deterioration processes. (Q7, Q3)

703-Q. Properties of Cast Iron at Elevated Temperatures. J. R. Kattus. *Foundry,* v. 85, June 1957, p. 172-176.

Results from creep-rupture tests at 800° F. with times varying from less than 100 to 5000 hr. on seven cast irons, including ferritic nodular and pearlitic gray irons containing various amounts of alloying elements, molybdenum, nickel and chromium. Measured resistance to thermal shock and thermal fatigue endurance at 800° F.; effect of alloying elements on creep and thermal properties. (Q3m, Q7a, Q10a, 2-12; CI-q, *Mo, Ni, Cr*)

704-Q. Effect of Cold Work on the Creep Rupture Properties of a Series of Simple 18-8 Stainless Steels. Frank B. Cuff, Jr., and Nicholas J. Grant. *Iron and Steel Institute, Journal,* v. 186, June 1957, p. 188-195.

Six simple 18-8 stainless steels were investigated at 1100 and 1200° F. Conclusions were drawn regarding the predictability of high-temperature properties as influenced by alloy content and the degree of cold work. 13 ref.
(Q3m, 318; SS)

705-Q. High-Temperature Properties of Cast Iron. J. R. Kattus. *Machine Design,* v. 29, May 30, 1957, p. 100-102.

Results of creep rupture and thermal-shock tests on seven plain and low-alloy cast irons.
(Q3m, Q10a, CI)

706-Q. Use of Molybdenum at High Temperatures. R. T. Begeley. *Materials in Design Engineering,* v. 48, July 1957, p. 154, 156, 158, 161-162, 164, 166. (CMA)

Alloys of molybdenum have higher useful strength above 1600° F. than any known materials; a graph shows the superiority over several other alloys. The alloys now available are the solid solution type which achieve maximum strength by strain hardening. Recrystallization temperature sets an important limitation on the operating temperature at which the good effects from working are retained. A number of coatings have been tested in an effort to overcome the oxidation problem above 1000° F. Coated components for jet engine parts show promise up to 2000° F.
(Q27a, 2-12, R1h; Mo)

707-Q. Evaluation of a Method of Determining the Tendency of Mild Steel to Brittle Fracture. *Metal Progress,* v. 72, July 1957, p. 154, 158. (Digest from *Centrum Voor Lastechniek N.V.L. — T.N.O.* Report No. SR532/1A, Apr. 1955, 99 p.).

Previously abstracted from original. See item 571-Q, 1956.
(Q26s, Q5, Q6; CN)

708-Q. Composition and Mechanical Properties of the Commonly Investment-Cast Alloys. *Precision Metal Molding,* v. 15, June 1957, p. 75-78.

Tabular presentation of composition and mechanical properties of alloys commonly cast as investment castings including stainless, carbon and low alloy toolsteels, nickel-base, copper-base and aluminum-base alloys, high-temperature alloys. (Q general; SS, TS, Ni, Cu, Al, SGA-h, 5-12)

709-Q. Instability of Plastic Flow of Metals at Very Low Temperatures. Z. S. Basinski. *Royal Society Proceedings,* v. 240, May 1957, p. 229-242.

The low-temperature unstable plastic deformation of aluminum alloys is described. It is shown that discontinuities in the stress-strain curve are caused by a localized temperature rise produced during the deformation. The calculated magnitudes of the drops in load and the transition temperature between smooth and discontinuous flow agree reasonably well with the ex-

perimental observations. It is believed that all metals would exhibit unstable deformation at sufficiently low temperatures. 13 ref. (Q24, 2-13; Al)

710-Q. Coated Molybdenum-Base Alloys. R. T. Begley. *Society of Automotive Engineers, Journal,* v. 65, June 1957, p. 7071. (CMA)

Alloys of molybdenum have higher useful strength above 1600° F. than any known materials; a graph shows the superiority over several other alloys. The alloys now available are the solid solution type which achieve maximum strength by strain hardening. Recrystallization temperature sets an important limitation on the operating temperature at which the good effects from working are retained. A number of coatings have been tested in an effort to overcome the oxidation problem above 1000° F. Coated components for jet engine parts show promise up to 2000° F. (Q27a, 2-12, L general; Mo)

711-Q. Secondary Hardness in Steels Alloyed With Vanadium, Molybdenum and Titanium. L. V. Zaslavskaia, et al. *Academy of Sciences of the USSR Bulletin. Physical Series,* v. 20, no. 6, 1956, p. 624-628. (Columbia Technical Translations.) (CMA)

Previously abstracted from the original. See item 981-Q, 1956. (Q29, J29, AY)

712-Q. (English.) **Internal Friction and Imperfections in Copper.** D. H. Niblett and J. Wilks. *Bulletin de l'Institut International Du Froid* (International Institute of Refrigeration), Supplement, Annexe 1956-2. Sept. 1956, p. 23-30.

Effects of imperfections on the internal friction of metallic crystals, in particular at low temperature. Investigations were primarily concerned with the effect of cold work on the internal friction of 99.999% polycrystalline copper. The specimens took the form of bars 12 cm. long, 1 cm. wide and about 1.5 mm. thick, which were given a preliminary anneal at 600° C. and then plastically deformed by longitudinal extension at room temperature. 7 ref. (Q22, M26s, 2-13; Cu)

713-Q. (English.) **On the Vibrational Damping of Structural Steel Beams.** Yoshikazu Yamada. *Kyoto University, Faculty of Engineering, Memoirs,* v. 19, no. 1, Apr. 1957, p. 1-13.

Experimental results and their consideration on the vibrational damping characteristics of model beams, and of actual steel highway bridges. The fundamental characteristics of damping due to internal frictions of the steel beam and the friction of bearing are clarified by using three kinds of beams; the damping characteristics of several bridges have been investigated and are compared with the results obtained by the experiments on model beams. (Q22; ST, SGB-s)

714-Q. (English.) **Investigation on Acid-Resistant High-Silicon Iron. Pt. 3. Effects of Cooling Rate and Annealing on Mechanical Properties and Corrosion Resistance.** Hiroshi Sawamura, Osamu Tajima and Kyoichi Akamatsu. *Kyoto University, Faculty of Engineering, Memoirs,* v. 19, no. 1, Apr. 1957, p. 77-91.

Variations in cooling rate bring about great changes in graphite structure and influence mechanical properties although not corrosion resistance. The annealing of castings is important only with respect to the relief of internal casting stress. 6 ref. (Q general, R general, E25n; Fe, *Si,* SGA-g)

715-Q. (French.) **Influence of Mechanical Stresses on Metallic Surfaces by Means of the Russel Effect.** C. Berger. *Métaux-Corrosion-Industries,* v. 32, May 1957, p. 185-190.

On the surface submitted to tension the deformation exceeds the elastic point of the aluminum film which is broken, resulting in an intense Russel effect. On the compressed surface the aluminum film is deformed without breaking and consequently does not provoke a Russel effect. 3 ref. (Q25k)

716-Q. (French.) **Thermal Behavior of Titanium and Its Alloys.** R. Syre. *Métaux-Corrosion-Industries,* v. 32, May 1957, p. 201-207. (CMA)

The behavior of titanium and its alloys at elevated temperatures. The properties examined included Young's modulus, flow characteristics and structural changes. Titanium alloys commercially available in France were used; their designations and compositions are indicated in a table. It was found that a 3-6% Al alloy gave the most satisfactory high-temperature characteristics. 4 ref. (Q general, 2-12; Ti)

717-Q. (French.) **Structure and Heat Treatment of T-A6V Forged Alloy.**

Adrien Saulnier and Robert Syre. *Revue de L'Aluminium,* no. 243, May 1957, p. 505-514.

Studies carried out in France for the commercial development of one of the latest titanium alloys. Determination of mechanical properties and of microstructures in relation to heat treatments, one of which, at 850° C., provides a wide interval of plasticity, while another, at 950° C., followed by aging, provides very high mechanical properties. 4 ref. (Q general, M27, 2-14; Ti)

718-Q. (German.) **Creep Rate of Heat Resistant Alloys.** Kurt Schaar. *Archiv für das Eisenhüttenwesen,* v. 28, Mar. 1957, p. 145-152.

Creep properties of a nickel alloy of 76% nickel and 20% chromium, at 650 to 750° C.; determination of validity of a formula developed by E. N. Andrade; calculations and references for practical test evaluation especially for the embrittlement of metals. 24 ref.
(Q3n, 1-4; Ni, Cr, SGA-h)

719-Q. (German.) **Solution of Various Problems of Fatigue by Means of the "Stepwise" System.** Hans Bühler and Walter Schreiber. *Archiv für das Eisenhüttenwesen,* v. 28, Mar. 1957, p. 153-156.

Statistical basis and prerequisites for the use of the "stepwise" system; determination of cyclic stress concentration factor as well as fatigue crack with smooth and notched samples of steel CK 10 during the rotating beam test. 9 ref. (Q7c, Q25k; ST)

720-Q. (German.) **The Impact Test.** W. Späth. *Metall,* v. 11, July 1957, p. 598-604.

A new impact test device (Izod test) was developed, measuring both the energy absorption and the peak load at the moment of impact. A series of tests on sintered aluminum, glass-fiber reinforced plastics and carbides was conducted. Relations between energy absorption, peak load and deformation were established experimentally. 5 ref.
(Q6, 1-3)

721-Q. (German.) **Effect of the Nitrogen Linkage by Aluminum on the Properties of High-Strength Structural Steels.** Hans Joachim Wiester, Walter Bading, Helmut Riedel and Werner Scholz. *Stahl und Eisen,* v. 77, June 13, 1957, p. 773-783.

Determination of the effect of finely divided inclusions of aluminum nitride on the grain size, mechanical properties and notch toughness in the normalized and artificially aged condition of experimental steel melts of 10, 50, or 1000 kg. of weight, prepared in the high-frequency furnace; testing the weldability and the hot hardness; effect of up to 0.1% phosphorus on the notch toughness of fine-grained steels. (Q general, M27c, 2-10; ST, SGB-a; *N, Al*)

722-Q. (German.) **Effect of Segregation, Cold Working and Aging on the Notch Toughness of Structural Steels of the Rimming Type.** Hermann Schenck and Eugen Schmidtmann. *Stahl und Eisen,* v. 77, June 13, 1957, p. 784-791.

Notch toughness - temperature curves of mild, rimming-type basic converter steel, of steel blown according to special procedures and of openhearth steel, as normalized, using samples taken from the segregation zone of the rolled product (slabs, sheet bars and billets); effect of cold working by stretching or upsetting and of an artificial aging with different tempering temperatures after cold working on the location of the steep incline of the notch toughness-temperature curves and on the maximum value of the notch toughness in the high level, as measured on a plain carbon, killed electric furnace steel containing 0.03% C and on a rimming-type basic converter steel with 0.06% C. (Q23s, 3-18, 2-15; ST-d)

723-Q. (German.) **Adequate Use of the Notch Toughness Value in the Current Assessment of the Tendency to Brittle Fracture and of the Weldability of Conventional Structural Steels.** Heinz Kornfeld. *Stahl und Eisen,* v. 77, June 13, 1957, p. 792-797.

Statistical analysis of the variations in the shape of the notch toughness-temperature curves for heavy plates made of conventional structural steels. Numerical relationship between the relative values of the medium notch toughness and the medium percentage crystallinity in the fracture of DVM and Charpy V-notch test bars. Conclusions to be drawn for an adequate definition of the transition temperature and for the possibilities of intelligent testing of materials.
(Q23s, Q26s, K9s; ST, SGB-s)

724-Q. (German.) **Deoxidation and Technological Characteristics of Killed**

Basic Converter Steels. Pt. 2. Contents of Inclusions, Degree of Purity and Characteristics of Killed Basic Converter Steels. Erwin Plockinger and Rupert Rosegger. *Stahl und Eisen,* v. 77, June 13, 1957, p. 798-804.

Investigations on basic converter steels containing manganese which had been deoxidized with silicon alone, with silicon and an addition of small amounts of aluminum, with silicon and aluminum in appropriate equal proportions, or with aluminum alone. Determination of the content, repartition and shape of the nonmetallic oxide inclusions in the cast ingot. Results of tensile, bending notched-bar impact tests, and bending tests on surface-welded specimens.
(Q27a Q5g, Q6n, D11r; ST-c, 9-19)

725-Q. (Japanese.) **Studies on Mechanical and Wear Resisting Properties of Low Mn-Mo Steel Castings.** Seishiro Miyazaki. *Iron and Steel Institute of Japan, Journal,* v. 43, Apr. 1957, p. 466-470.

Mechanical and abrasion resisting properties of low Mn-Mo steel castings containing 1.1-1.7% Mn and 0.2-0.4% Mo were investigated. Heat treatments used were homogenizing and normalizing or double normalizing. Tempering was carried out by furnace cooling from 6₀0-550° C. Wear resistance of 1.20% Mn steel castings was superior to that of 1.63% Mn or 0.52% C and 1.39% Mn steel castings.
(Q9n, 2-14; AY, *Mn, Mo,* 5)

726-Q. (Japanese.) **On the Fatigue Behavior of Commercially Pure Titanium. II.** K. Takeuchi. *Light Metals (Tokyo),* v. 7, May 1957, p. 82-87. (CMA)

Mean stress versus fatigue properties were studied for annealed and 50% cold rolled titanium sheet on Schenk's vibrating sheet bending machine. Notch effects on the fatigue strength of annealed titanium rods were studied on Ono's rotary bending machine. Mechanical and chemical composition data are tabulated, and the endurance limit diagram and S-N curves are shown. 10 ref. (Q7g; Ti-a)

727-Q. (Japanese.) **Ultra-High-Strength Steel.** Chiaki Asada. *Metals,* v. 27, June 1957, p. 482-486.

Characteristics, chemical compositions, heat treatment; relationship between the tempering and mechanical properties of ultra-high-strength steel. 4 ref.
(Q general, J general; ST, SGB-a)

728-Q. (Russian.) **Properties of Cast Alloy Structural Steel.** B. B. Gulaev, I. A. Shapranov, V. M. Shpeitzman and P. E. Kovalenko. *Liteinoe Proizvodstvo,* no. 2, Feb. 1957, p. 11-16.

Composition, tensile strength, relative elongation and compression, impact resistance and Brinell hardness of six low-alloy steels. Superior qualities of the castings obtained from the alloy steel are stressed. Graphs of the impact resistance of the steels as a function of cooling time and low temperature are presented. Mechanical properties of samples cut out of experimental castings are tabulated and a graph of the steels' fluidity is given. Crack formation and weldability are discussed.
(Q general, E25p, K9s; AY, 5)

729-Q. Multiple Slip in Bicrystal Deformation. J. D. Livingston and B. Chalmers. *Acta Metallurgica,* v. 5, June 1957, p. 322-327.

Experimental observation of slip lines on aluminum bicrystals deformed in tension. Emphasis was on the multiple slip associated with the interaction between two crystals at the boundary. Model employing pile-up of dislocations at grain boundary led to a method of predicting which additional slip systems will operate in a given bicrystal. 18 ref. (Q24a, M26)

730-Q. Non-Linear Elasticity in Aluminium Alloys. A. B. Watts. *Aeronautical Quarterly,* v. 8, May 1957, p. 103-122.

Tests have been carried out on round bar specimens of various strong aluminum alloys (unclad) in the fully heat treated condition in both tensile and compressive loading. A careful study of the results establishes beyond reasonable doubt that there is a progressive change in the tangent elastic modulus with stress. The variation is appreciably greater than that predicted by the consideration of second-order effects in the conventional stress and strain representation. (Q21; Al)

731-Q. Manufacture and Metallurgy of Flash-Welded Line Pipe. Merrill A. Scheil, George E. Fratcher, Scott L. Henry and Ewald H. Uecker. *American Society of Mechanical Engineers,* Paper no. 57-ASME-EIC-3, 18 p.

Burst tests were conducted down to −50° F. Charpy V-notch-bar tests

were made on the pipe material over a range of −100 to +212° F. to determine the energy-temperature transition curves. 7 ref.
(Q23, Q6, K3r)

732-Q. Brittle Fracture in Steel as Related to Flash Welded Line Pipe. Pt. 2. Merrill A. Scheil, George E. Fratcher, Scott L. Henry and Ewald H. Uecker. *American Society of Mechanical Engineers,* Paper no. 57-ASME-EIC-4, 8 p.

Metallurgical concepts of brittle fracture and design methods to safeguard against it. 13 ref.
(Q26s, K3r)

733-Q. Variability of Mechanical Properties of Flat Rolled Sheet Product. John V. Sturtevant. *American Society for Quality Control, National Convention Transactions,* May 1957, p. 181-190.

Variabilities found in Olsen ductility cup tests made on 25 sheets of rimmed steel taken from the middle of the lengths of 25 coils rolled straightaway on a conventional mill.
(Q23p; ST, 4-3)

734-Q. Observations on the Stress-Strain Behaviour of a Series of Unalloyed High-Duty Pearlitic Irons of the Inoculated Type. H. K. Lloyd and J. V. Harding. *British Foundryman,* v. 50, July 1957, p. 352-358.

Relationship between tensile strength and various elastic and plastic properties for six irons. These include elastic modulus values at different applied stresses and conventional values of elastic limit. Effects of structure, mass effect and rate of stressing on these properties. 9 ref. (Q27a, Q21; CI)

735-Q. Creep-Resisting Steel Castings for Use at Medium and High Temperatures. H. Zeuner. *Foundry Trade Journal,* v. 102, May 30, 1957, p. 657-663.

Creep resisting properties necessary in castings for use at high temperatures and pressures found in gas turbine and furnace application. Chemical composition and mechanical properties of several typical high-temperature cast steels of low, medium or high-alloy types. 7 ref. (Q3m, 2-12, 3-24; ST, 5-10)

736-Q. Boron Solves "Hot Shortness" in Stainless Steels. D. I. Loveless and F. K. Bloom. *Iron Age,* v. 179, June 20, 1957, p. 95-97.

Small additions of boron improve hot working performance. Table of levels of boron satisfactory for various grades from hot working and structural standpoints.
(Q26s, 2-10; SS, *B*)

737-Q. For High-Temperature Strength: Stainless or Tool Steel? E. A. Loria. *Iron Age,* v. 179, June 13, 1957, p. 132-135.

On basis of design requirements, toolsteels achieve a higher level of tensile and yield strength over the range of 72-1100° F.
(Q27a, 2-12; SS, TS)

738-Q. Effect of Alloying Elements on Tensile Strength. J. Glen. *Iron and Steel,* v. 30, June 1957, p. 295-312.

Effect on high-temperature tensile properties of low-carbon steel was investigated for the following alloys: manganese, chromium, molybdenum, tungsten, vanadium, titanium, silicon nickel and copper.
(Q27a, 2-10; CN, AY)

739-Q. Properties of Cast Iron at Elevated Temperatures. J. R. Kattus. *Iron and Steel,* v. 30, July 1957, p. 356.

Seven plain and low-alloy cast irons were tested for creep-rupture and thermal shock. Table of 10-year rupture strength and thermal-fatigue endurance limit at 800° F.
(Q3m, Q7a, Q10a; CI)

740-Q. Brittle Failure in Ductile Steel. S. A. Main. *Iron and Steel,* v. 30, July 1957, p. 365-367.

A tentative method of testing intended for static tensile operation to provide stress figures, which should be adaptable as an impact tensile test. 4 ref. (Q26s, Q27b; ST)

741-Q. Study of Temper-Brittleness in Cr-Mn Steel Containing Large Amounts of Molybdenum, Tungsten and Vanadium. A. E. Powers. *Iron and Steel Institute, Journal,* v. 186, July 1957, p. 323-328. (CMA)

Additions of molybdenum and vanadium together decrease the susceptibility to temper-brittleness while the single additions increase it. Results are considered from the viewpoint that susceptibility to temper brittleness is controlled by the interaction energy for granular segregation of the solute additions and by the diffusion rates of the segregating elements. (Q26s, 2-10; AY)

742-Q. Effect of Stress on Creep at High Temperatures. H. Laks, C. D. Wiseman, O. D. Sherby and J. E. Dorn. *Journal of Applied Mechanics,* v. 24, June 1957, p. 207-213.

Experimental investigation on relationship of high-temperature creep rate to stress in pure aluminum and its solid solution alloys. Conditions include both low and high stresses. Discusses observations in light of a theoretical dislocation climb model for high-temperature creep. 14 ref. (Q3, 2-12, 3-16; Al)

743-Q. Statistical Appraisal of the Prot Method for Determination of Fatigue Endurance Limit. W. A. Hijab. *Journal of Applied Mechanics,* v. 24, June 1957, p. 214-218.

Statistical analysis of precision of the estimate of endurance limit as determined by Prot method. Statistical efficiency found to be less than probit and staircase method: found that optimum efficiency of Prot method achieved only when two rates of increase of stress as widely separated as possible are used. 12 ref. (Q7a, S12)

744-Q. Stress Distributions in Rotating Disks Subjected to Creep at Elevated Temperature. A. M. Wahl. *Journal of Applied Mechanics,* v. 24, June 1957, p. 299-305.

Curves of stress distribution as function of radius calculated for various temperatures and thicknesses of rotating chromium steel disks, subjected to steady-state creep at elevated temperatures. (Q3, 2-12; AY)

745-Q. A Note on the Metallography of Cracking During Creep. D. McLean. *Journal of the Institute of Metals,* v. 85, July 1957, p. 468-472.

Commercial creep resistant metals, broken in creep tests at various stresses and temperatures, were examined. At low stress fractures began by formation of isolated cavities lying mainly in transverse grain boundaries; at high stress, fracture started with cracks which appeared to be produced by relatively large stress concentrations. 13 ref. (Q3, Q26)

746-Q. Effect of Heat Treatment and Structure on the Creep and Stress-Rupture Properties of Nimonic 80A. W. Betteridge and A. W. Franklin. *Journal of the Institute of Metals,* v. 85, July 1957, p. 473-479.

Three factors control creep characteristics: Time and temperature of solution treatment determines creep rate; precipitation of chromium carbide at grain boundaries determines amount of creep; time and temperature of normal hardening phase affect both creep rate and extension at fracture. 5 ref. (Q3m, 2-14, 3-21; Ni)

747-Q. Intercrystalline Cracking in Creep of Some Aluminum Alloys. B. J. Nield and A. G. Quarrell. *Journal of the Institute of Metals,* v. 85, July 1957, p. 480-488.

Two high-purity aluminum alloys containing 1.28 and 5.15% manganese were studied. Constant-strain-rate method of deformation was employed. General theory of intercrystalline cracking is proposed. 8 ref. (Q3; Al)

748-Q. On a Mechanism of High Temperature Intercrystalline Cracking. C. W. Chen and E. S. Machlin. *Journal of Metals,* v. 9; *AIME Transactions,* v. 209, July 1957, sec. 2, p. 829-835.

Formation of voids at grain boundaries is considered to be primarily responsible for brittle failure of metals at elevated temperature. Voids once nucleated grow either by vacancy condensation or plastic yielding or both. 13 ref. (Q26s, 2-12; Cu)

749-Q. Tensile Properties of Zone Refined Iron in the Temperature Range from 298° to 4.2° K. R. L. Smith and J. L. Rutherford. *Journal of Metals,* v. 9; *AIME Transactions,* v. 209, July 1957, sec. 2, p. 857-864.

The higher the purity, the lower the flow stresses and the better the low-temperature ductility. Major portion of ductility at 4.2° K. arises from twinning; prestraining at room temperature does not suppress twinning at 4.2° K. 36 ref. (Q27a, Q24b; Fe)

750-Q. Temperature Dependence of the Hardness of Secondary Phases Common in Turbine Bucket Alloys. J. H. Westbrook. *Journal of Metals,* v. 9; *AIME Transactions,* v. 209, July 1957, sec. 2, p. 898-904.

Most common types of secondary phases in turbine bucket alloys were synthesized in bulk and hardness measured from room temperature to 800° C. High hot hardness of the dispersed phase is an important factor in high-temperature strength of alloys but other factors are also significant. 68 ref. (Q29n, 2-12; SGA-h)

751-Q. Shear Along Grain Boundaries in Aluminum Bicrystals. S. K. Tung and R. Maddin. *Journal of Met-*

als, v. 9; *AIME Transactions*, v. 209, July 1957, sec. 2, p. 905-910.

Aluminum bicrystals 99.99% pure having a pure tilt boundary about the <110> axis were subjected to creep stresses along their boundary at various temperatures. Mechanism for grain boundary shear is considered to be a combination process involving slip and grain boundary self-diffusion. 18 ref. (Q2g; Al)

752-Q. Abrupt Yielding and the Ductile-to-Brittle Transition in Body-Centered-Cubic Metals. E. T. Wessel. *Journal of Metals*, v. 9; *AIME Transactions*, v. 209, July 1957, sec. 2, p. 930-935.

Abrupt yielding and transition from a ductile-to-brittle behavior are shown to be closely related to one another and to a common origin. Mechanism is described for abrupt yielding and the ductile-to-brittle transition. 20 ref. (Q23r, Q26s)

753-Q. Relative Creep Resistance of Cast Al-Si-Cu Alloys to LM4 and LM21. J. McKeown and R. D. S. Lushey. *Metallurgia*, v. 56, July 1957. p. 27-28.

Tests show there is no marked difference at 200° C. in creep resistance of the alloys containing 0.35 and 2% zinc. (Q3m, 2-10; Al, Zn)

754-Q. Testing Sheet Metal for Drawing. *Metalworking Production*, v. 101, May 10, 1957, p. 795-797.

Machine for performing Swift cup forming test and other tests on drawability of sheet metal, of single-stage cup forming or stretch-forming types. (Q3q, G4)

755-Q. Plastic Deformation of Aluminum Single Crystals at Elevated Temperatures. R. D. Johnson, A. P. Young and A. D. Schwope. *National Advisory Committee for Aeronautics*, Report 1267, 1956, 31 p.

Experiments were carried out by two different methods on the effect of small amounts of prestraining, on the creep and tensile properties of aluminum single crystals. Two high-resolution X-ray techniques used to detect and to follow the strain in these experiments showed a definite polygonization of the crystalline lattice during creep. 70 ref.
(Q24, Q27a, Q3m, 2-12; Al, 14-11)

756-Q. Rare Earth Alloys Promise New Strength for Steel. *Petroleum Engineer*, v. 29, Aug. 1957, p. B76. (CMA)

An alloy steel developed for armor plate shows promise in many applications. One-half lb. per ton of lanthanum, cerium or lanthanon mixtures is added, giving improved impact values, lower transition temperatures, and 20-60% higher reduction of area at all temperatures. Hardenability is the same as that of ordinary steel. Tempering in the temper-brittle range permits adequate ductility.
(Q general; AY, EG-g)

757-Q. On the Activation Energy of High Temperature Creep in Metals. Paul Feltham. *Philosophical Magazine*, v. 2, May 1957, p. 584-588.

The temperature dependence of the activation volume of "stress-concentration factor" q appearing in the expression $de/dt = A \exp(-H/kT) \sinh(q\sigma/kT)$ relating the equilibrium tensile creep rate de/dt, the temperature T and the applied tensile stress σ has been studied in the case of several pure metals subject to creep above about $\frac{1}{2}T_m$, where T_m is the melting point. 10 ref. (Q3m, P13a)

758-Q. Dislocation Locking and Fracture in X-Iron. J. Heslop and N. J. Petch. *Philosophical Magazine*, v. 2, May 1957, p. 649-658.

The inhibition of plastic deformation by dislocation locking promotes brittleness. The influence of manganese in iron is studied in detail and it is concluded that the ductility conferred by the manganese is associated with weakened dislocation locking as well as with grain refinement. The weakening of the locking appears to be due to interaction between nitrogen and manganese atoms. 12 ref. (Q24; Fe, Mn)

759-Q. Thermal Stress Fatigue. L. F. Coffin, Jr. *Product Engineering*, v. 28, June 1957, p. 175-179.

Difference between mechanical and thermal fatigue; origin of thermal stresses; design criteria to use. (Q7j)

760-Q. Vibration Tests. Robert W. Stephens. *Steel*, v. 140, May 20, 1957, p. 168, 171, 172, 175.

Suggestions on testing structures by vibration; fatigue tests, specification tests; procedures for tests.
(Q10, Q7, 1-4)

761-Q. Thin Strip Hardness Can Be Misleading. John T. Richards. *Steel*, v. 141, July 1, 1957, p. 86-87.

Effect of strip thickness on hardness. Hardness readings can vary without corresponding change in strength. Tensile tests are more accurate. (Q29n, 3-23; 4-3)

762-Q. New Ti Alloy. *Steel,* v. 141, July 29, 1957, p. 131. (CMA)

Rem-Cru has developed a titanium alloy with 6.5% Al and 3.75% Mo, designated C-130AMo, which has the advantages of improved time-temperature stress stability, deep hardenability, better high-temperature strength, and good heat treated properties. A graph compares properties with those of other alloys. The alloy has promise in jet engine disks and blades and in fasteners and airframe forgings.
(Q general; Ti)

763-Q. Effect of Sodium on the Mechanical Properties of Zirconium. J. C. Bokros. *U. S. Atomic Energy Commisssion,* NAA-SR-1867, June 15, 1957. 39 p. (CMA)

The surface oxide which develops lowers the fatigue life at high temperatures but hydrogen has little effect on the fatigue life. The grain growth which occurs above 950° F. reduces fatigue life severely. Sodium does not harm hot tensile properties. Data show that zirconium is stable to dimensional changes after thermal cycling.
(Q general; Zr, *H, Na*)

764-Q. Use of Titanium Alloy Sheet in Airframe Components. L. R. Jackson. Battelle Memorial Institute. Titanium Metallurgical Laboratory, Report 5A. *U. S. Office of Technical Services,* PB 124790. July 1955, 23 p. (CMA)

Commercially realizable and quantitatively significant criteria are presented for the strength-weight ratios of titanium sheet alloys. Other factors governing the use of sheet materials are discussed. Although higher strength alloys might broaden use, other less favorable effects begin to operate at very high strength levels. (Q23, T24a, 17-7;Ti)

765-Q. Crack Propagation in the Hydrogen-Induced Brittle Fracture of Steel. W. J. Barnett and A. R. Troiano. Case Institute of Technology (Wright Air Developments Center.) *U. S. Office of Technical Services,* PB 121065, Aug. 1955, 58 p. $1.50.

Static fatigue fracture process in high-strength steel was found to be one of almost immediate crack initiation after loading above the static fatigue limit, then "slow" crack growth followed by cataclysmic crack propagation, or fracture. A newly developed electrical resistance method for measuring crack growth permitted analysis of the kinetics of the crack propagation process and the factors which determine the static fatigue fracture stress. (Q26s; ST, SGB-a)

766-Q. Research on Effect of Prestraining and Notch Sharpness on the Notch Strength of Materials. G. W. Geil and N. L. Carwile. Wright Air Development Center, Technical Report 56-402. *U. S. Office of Technical Services,* PB 121782. Oct. 1956, 113 p. (CMA)

Ti-75A and C130AM were studied for the effect of prestraining in tension at room and liquid nitrogen temperatures on the tensile properties; some specimens were in the notched conditions. Impact properties of Charpy V-notch specimens in the −196 to 300° C. range were determined. (Q23s, 2-13; Ti)

767-Q. Hydrogen Contamination in Titanium and Titanium Alloys. Pt. 2. Strain Aging Hydrogen Embrittlement in Alpha-Beta Titanium Alloys. H. M. Burte. Wright Air Development Center, Technical Report 54-616. Pt. 3. *U. S. Office of Technical Services,* PB 121786, Oct. 1956, 51 p. (CMA)

Susceptibility to strain-aging embrittlement is affected by composition and microstructure. Higher temperatures decrease the tendency but increase the rate. A mechanism for strain aging embrittlement is proposed. Other types of hydrogen embrittlement are noted.
(Q26s, N7e; Ti)

768-Q. Cumulative Fatigue Damage of Aircraft Structural Materials. Pt. 2. 2024 and 7075 Aluminum Alloy—Additional Data and Evaluation. A. M. Freudenthal and R. A. Heller. Columbia University (Wright Air Development Center.) *U. S. Office of Technical Services,* PB121909, Oct. 1956, 27 p. 75¢.

Tests were conducted on 20 unnotched specimens of 2024 and 7075 aluminum alloys to determine the effect on fatigue life of randomly varying stress-amplitudes representing gust or maneuver load sequences encountered during flights. A nonlinear cumulative damage theory was developed that approximated test results reasonably well for unnotched specimens used in the tests. Tentative conclusion is

that with decreasing severity of the load distribution the comparative fatigue performance of alloy 7075 improves, but for increasingly severe distribution 2024 is definitely the more reliable material. (Q7a; Al)

769-Q. The Relation of Heat Treatment to the Dynamic Properties of Some Carbon Steels. R. C. Smith. Naval Research Laboratory. *U. S. Office of Technical Services,* PB 121514, Nov. 1956, 16 p. 50¢.

SAE 1035 and 1045 specimens that had been annealed or quenched and tempered were subjected to static or dynamic axial loads. The dynamic yield stress was a maximum for specimens tempered in 800 to 1100° F. range. Data showed ductility to be generally higher for the dynamic tests than for the static tests. The ratio of dynamic yield stress to static yield stress was smaller at the lower tempering temperatures. (Q23b, 2-14; CN)

770-Q. Properties of Constructional Metals as a Function of Temperature and Strain Rate in Torsion. E. P. Klier. Syracuse University (Wright Air Development Center). *U. S. Office of Technical Services,* PB 121912, Nov. 1956, 201 p. $4.

Torsion tests were conducted on cylindrical and tubular specimens of structural alloys to evaluate the reduction of the modulus of rupture that was observed in previous research to accompany increasing strain rate. The cause of the reduction in strength, its magnitude and the generality of the phenomenon were investigated. Results confirmed the trends established earlier that the modulus of rupture of the structural metals was reduced in the ambient temperature range with increasing strain rate.
(Q1a; SGB-s)

771-Q. Relaxation Behavior of Titanium Alloys. F. J. Gillig. Wright Air Development Center, Technical Report 55-458, Pt. 2. *U. S. Office of Technical Services,* PB 121978, Dec. 1956, 87 p. (CMA)

Relaxation tests were made on heat treated A-70, C-130AM and A-110AT in all of the microstructural conditions at 70, 600 and 800° F. The equipment is described. The grain size effect was similar to that in creep testing where the larger sizes resisted deformation more only at the higher test temperatures.
(Q3a, 1-3; Ti)

772-Q. Wear Studies With Titanium. R. J. Benzing and A. N. Damask. Wright Air Development Center, Technical Report 56-375. *U. S. Office of Technical Services,* PB 121885, Jan. 1957, 20 p. (CMA)

Typical oils were used in a wear study of titanium (i.e., mineral oil, diester, silicate ester, silicone, halogenated hydrocarbon). Test equipment described. The Ti-150A, C-130AM and Ti-3Al-5Cr specimens were tested with surfaces in the cyanided and uncyanided conditions. (Q9n, 1-3, 1-4; Ti, Nm-h)

773-Q. Effect of Microstructural Variables and Interstitial Elements on the Fatigue Behavior of Titanium and Commercial Titanium Alloys. C. B. Dittmar, G. W. Bauer and D. Evers. Wright Air Development Center, Technical Report 56-304. *U. S. Office of Technical Services,* PB 121972, Jan. 1957, 96 p. (CMA)

Microstructure versus fatigue behavior was studied for Ti-6Al-4V, Ti-3Mn complex and Ti-5Al-2.5Sn. Endurance limit was not much affected unless the structure was extremely coarse or embrittled. Interstitial contents at the level of commercial titanium were studied for the three alloys. At this interstitial level the fatigue life is increased or unchanged. (Q7a, 3-21; Ti)

774-Q. Evaluation of Bend Testing of Titanium Sheet. W. P. Achbach and E. G. Bodine. Battelle Memorial Institute, Titanium Metallurgical Laboratory, Report 68. *U. S. Office of Technical Services,* PB 121626, Apr. 1957. (CMA)

The literature of bend testing is reviewed and apparatus, procedures and specimen types now used are described prior to recommendation of a uniform bend test procedure for titanium sheet. (Q5, 1-4; Ti)

775-Q. Notch Sensitivity of Titanium and Titanium Alloys. F. C. Holden. Battelle Memorial Institute, Titanium Metallurgical Laboratory, Report 69. *U. S. Office of Technical Services,* PB 121627, Apr. 1957, 91 p. (CMA)

Testing programs are discussed in the light of present knowledge of the mode of failure of notched specimens. Recommendations are made for further studies. (Q23s; Ti)

776-Q. Fracture Characteristics of Copper-Base Alloys. N. C. Howells and E. A. Lange. Naval Research Laboratory. *U. S. Office of Technical Services,* PB 121933, Apr. 1957, 12 p. 50¢.

Drop-weight and Charpy V tests conducted at temperatures between 210 and −300° F. showed that the fracture relationships of 15 Navy copper-base alloys were different from those of steel in that a Charpy V energy level of 10 ft-lb. does not indicate a brittle condition for copper-base alloys. The alloys with Charpy V energy values from 3 to 10 ft-lb. were found to deform plastically even in the presence of a sharp notch. (Q26, Q6; Cu)

777-Q. Fatigue Resistance of Simulated Nozzles in Model Pressure Vessels. George Welter and Julien Dubuc. *Welding Journal,* v. 36, June 1957, p. 271s-274s.

Tests were made on vessels of A201, Grade A, and A302, Grade B steels under cyclic internal pressure. All fractures in the nozzles occurred in longitudinal direction of the pressure vessels and began at edge where the nozzle hole meets with the internal surface of the vessel shell. (Q7, T26q; ST)

778-Q. Plastic Behavior of Structural Members and Frames. George C. Driscoll, Jr., and Lynn S. Beedle. *Welding Journal,* v. 36, June 1957, p. 275s-286s.

Report of demonstration tests conducted during summer course "Plastic Design in Structural Steel" at Lehigh University. New design concept was presented by which maximum strength of structural steel is revealed by analysis of plastic rather than elastic behavior under load. 5 ref. (Q23, 17-1; ST, SGB-s)

779-Q. Effect of Neutron Irradiation on the Mechanical Properties of Some Structural Steels. E. E. Baldwin. *Welding Journal,* v. 36, July 1957, p. 342s-347s.

A302 steel showed little or no change in properties. A201 showed substantial increase in strength and loss of ductility and energy absorption. Recovery of A201 damage could be accomplished by annealing at 600° F. 11 ref.
(Q general, 2-17; ST, SGB-s)

780-Q. Effect of Surface Condition on the Fatigue Resistance of Hardened Steel. G. H. Robinson. Paper from "Fatigue Durability of Carburized Steel", American Society for Metals, 1957, p. 11-46.

Investigates effect of surface decarburization on fatigue durability of hardened spring steel by directional bending at different magnitudes of stress; effects of excess carbide in discontinuous network in carburized case; core hardness and intergranular oxidation occurring at surface of steel when carburized by conventional methods.
(Q7a, J4a, J28g; ST)

781-Q. Residual Stresses in Carburized Steels. William S. Coleman and Milton Simpson. Paper from "Fatigue Durability of Carburized Steel", American Society for Metals, 1957, p. 47-67.

Data on the distribution of residual stress following gas carburizing of SAE 8620, 8640, 8617, 1010, 1018 and 9310 steel specimens using different atmospheres, material of varying core hardness, varying case depth and following tempering or refrigeration; stresses measured by sectioning or X-ray diffraction method. (Q25h, J28g; ST)

782-Q. Fatigue Durability of Carburized Steels. J. G. Roberts and R. L. Mattson. Paper from "Fatigue Durability of Carburized Steels", American Society for Metals, 1957, p. 68-105.

One-directional bending fatigue test conducted on variously carburized and hardened steel specimens in effort to correlate residual stresses as introduced by heat treatment with fatigue properties. Variables examined were material composition, case depth, section size, tempering, refrigeration and removal of thin surface by electropolishing. (Q7a, Q25h, J28g; ST)

783-Q. Metallurgy at Low Temperatures. C. S. Barrett. *American Society for Metals, Transactions,* v. 49, 1957, p. 53-117.

The 1956 Campbell Memorial Lecture which deals with the purpose and some results of low-temperature research, the problem of brittle fracture, crystallography and transformations, radiation effects. 155 ref.
(Q general, 2-13)

784-Q. Study of Mechanism of Effect of Boron by the Internal-Friction Method. M. V. Pridantsev, et al. *Doklady Akademii Nauk,* v. 111, 1956, p. 98-101. (*Henry Brutcher Translation* no. 3953).

Experimental procedure in measuring internal friction; temperature dependence of internal friction in steel without boron and with 0.002, 0.004, 0.006 and 0.008% boron. Nature of low and high-temperature maxima of internal friction and ef-

fect of preliminary heat treating of specimens. Variation of modulus of shear and of impact values.
(Q21; ST, *B*)

785-Q. Effect of Hydrostatic Pressure Upon the Hardness of Carbon Steel. V. A. Gladkovskii. *Fizika Metallov i Metallovedenie,* v. 3, 1956, p. 183-184. (*Henry Brutcher Translation* no. 3941).

Usefulness of determination of effect of hydrostatic pressures on hardness of materials for learning about behavior when pierced by a projectile and for developing a nondestructive method of measuring residual stresses. Experimental setup and procedure; results obtained on a 0.26% C, 0.5% Mn steel. Conclusions as to limitations of use of dependence of hardness on tensile strength for range of high pressures. (Q29n, 3-24; Q25h; CN)

786-Q. Creep Resistance of Alloys as Function of Their Composition. A. A. Bochvar. *Izvestiya Akademii Nauk, OTN,* no. 1, Jan. 1957, p. 136-138. (*Henry Brutcher Translation* no. 3945).

Theory that creep resistance is improved by a hetergeneous structure and attempt to correlate this theory with that which ascribes most importance to a multicomponent solid solution. Recommended line to follow in future searches for new creep-resisting alloys. (Q3m, 2-10)

787-Q. High-Temperture Fatigue Tests With Repeated or Cyclic Tensile Stressing. G. Vidal and P. Lanusse. *La Recherche Aéronautique,* v. 45, May-June 1955, p. 45-51. (*Henry Brutcher Translation* no. 3898).

Particulars on apparatus used; furnace, fatigue testing machine and its operation; mean-load controller and recorder; monitoring the mean-load variations; correcting system; recording the fluctuating component of load simultaneously with temperature. (Q7j, 1-3)

788-Q. Mechanical Nature of Temper Brittleness. N. V. Tolstoguzov. *Metallovedenie i Obrabotka Metallov,* v. 2, 1956, p. 28-30, (*Henry Brutcher Translation* no. 3854).

Stress-strain diagrams of specimens taken from disks cut from the ingots and then water quenched versus furnace cooled. Tensile and impact test data. Conclusions as to a direct relationship between temper brittleness and drop of tensile strength. (Q26s, Q27a; ST)

789-Q. (Italian.) **Correlation Between Chemical Composition, Micrographic Structure and Breaking Strength of Spheroidal Cast Irons.** C. Gianola. *Fonderia Italiana,* v. 6, Feb. 1957, p. 65-72.

Calculation of modulus of elasticity of cast irons, with particular reference to spheroidal. Influence of additions of nickel, manganese, copper, silicon, chromium on ferrite and pearlite. 4 ref.
(Q21a, 2-10, 3-21; CI-r)

790-Q. (Italian.) **Influence of Iron and Zinc on Die Castings Made of G-Al Si8.5 Cu Alloy (UNI 3601).** D. Gualandi and G. Piatti. *Fonderia Italiana,* v. 6, Apr. 1957, p. 145-149.

Preparation of test pieces, radiographic and metallographic examination, mechanical tests, influence of iron on workability; 0.8-1.0% Fe improved technological characteristics of alloy, especially ease of separation from die. Same proportion of Fe resulted in slight decrease in mechanical properties. Presence of zinc did not exert any appreciable influence; therefore 0.5% Zn appears tolerable. 7 ref.
(Q general, 2-10; Al, 5-11)

791-Q. (Japanese.) **Fatigue Rupture Study by Metallography.** Shigeo Yamato and K. Morikawa. *Japan Society of Mechanical Engineers, Journal,* v. 60, May 1957, p. 491-494.

Fatigue rupture study of low and high-carbon steel by microscopy. Majority of tests were made on railroad car wheels. (Q7, M27; CN)

792-Q. (Japanese.) **Fatigue Strength Data on Structural Alloy Steel.** *Japan Society of Mechanical Engineers, Journal,* v. 60, May 1957, p. 503-523.

Structural alloy steel data tabulated as follows: fatigue limit and tensile strength; stress-strain cycles. Included are nickel-chromium steel, nickel-molybdenum steel, chromium steel, chromium-molybdenum steel, aluminum - chromium - molybdenum steel, stainless steel, spring steel.
(Q7a; AY, SGB-s)

793-Q. (Japanese.) **Fatigue Strength Data for Cast Steels and Cast Iron.** *Japan Society of Mechanical Engineers, Journal,* v. 60, May 1957, p. 524-531.

Tables and graphs of fatigue limit and tensile strength; stress-strain cycles and related experimental data. (Q7a, Q27a; ST, 5, CI)

794-Q. (Japanese.) **Fatigue Strength Data for Copper and Copper Alloys.** *Japan Society of Mechanical Engineers, Journal,* v. 60, May 1957, p. 533-540.

Tables and graphs of the creep. tensile strength, and stress-strain cycles of copper and copper alloys; data for plate, bar and cast copper alloys. (Q7a, Q3m, Q27a; Cu)

795-Q. (Japanese.) **Fatigue Strength of Light Alloys.** *Japan Society of Mechanical Engineers, Journal,* v. 60, May 1957, p. 541-554.

Tables and graphs of the creep, tensile strength, and stress cycles for aluminum and aluminum alloys, magnesium and magnesium alloys. (Q7a, Q3m, Q27a; Al, Mg)

796-Q. (Book.) **Fatigue Durability of Carburized Steel.** J. B. Bidwell, G. H. Robinson, W. S. Coleman, R. F. Thomson, R. L. Mattson, J. G. Roberts and M. Simpson. 1957. 123 p. American Society for Metals, 7301 Euclid Ave., Cleveland 3, Ohio. $4.

Reviews literature and reports investigations on the effect of surface condition on fatigue resistance and the distribution and effect of residual stresses on fatigue durability of carburized steels. Contains three papers, abstracted separately, plus introduction by J. B. Bidwell and summary by R. F. Thomson. 45 ref. (Q7a; ST, 14-19)

797-Q. How To Apply Hardness Testing in the Shop. Vincent E. Lysaght. *American Machinist,* v. 101, Aug. 12, 1957, p. 133-140.

Brinell and Rockwell tests and problems relating to their proper use in quality control; machines in current use. (Q29, 1-3)

798-Q. Tensile Properties of Pearlitic Nodular Irons in Air and Water. G. N. J. Gilbert. *British Cast Iron Research Association, Journal of Research and Development,* v. 6, June 1957, p. 630-637.

Examines and compares tensile strength of as-cast and pearlitic nodular irons in air, water, mercury, trichlorethylene, ethyl alcohol, butyl acetate, butyl alcohol ethyl ether and glycerine. (Q27a, 2-16; CI-r)

799-Q. High Temperature Tensile Properties of Nodular Graphite Cast Irons. K. B. Palmer. *British Cast Iron Research Association, Journal of Research and Development,* v. 6, June 1957, p. 638-659.

Investigation of tensile properties of two pearlitic and two ferritic industrially produced nodular irons for temperatures up to 600° C.; effects of varying arsenic, phosphorus and other minor element content on high-temperature tensile properties. (Q27a, 2-12, 2-10; CI-r)

800-Q. Effect of Understressing on the Fatigue Properties of Coarse Flake Graphite Cast Irons. K. B. Palmer. *British Cast Iron Research Association, Journal of Research and Development,* v. 6, June 1957, p. 660-665.

Understressing for 20 million cycles at stress of 0.5 ton per sq. in. below fatigue limit did not significantly change fatigue limit or fatigue life for two coarse-flaked graphite cast irons in unnotched specimens. Slight increases found in notched fatigue limit. 3 ref. (Q7a; CI)

801-Q. Effect of Heating and Cooling on The Mechanical Properties of an Alloy Steel. A. S. Kenneford and T. Williams. *Chartered Mechanical Engineer,* v. 4, June 1957, p. 292-293.

Tensile, impact tensile and Charpy impact determined for a chromium-molybdenum steel heated at temperature above upper critical range, followed by cooling at two different rates.
(Q27a, Q27b, Q6n, 2-14; AY, *Cr, Mo*)

802-Q. Stress-Relaxation Behavior of Chromium-Molybdenum and Chromium-Molybdenum-Vanadium Bolting Materials. J. A. Stafford and M. G. Gemmill. *Chartered Mechanical Engineer,* v. 4, June 1957, p. 295-296.

Behavior of bolt steels under constant strain and weight-bar tests. (Q3a; AY, *Cr, Mo, V*)

803-Q. Improving the Mechanical Properties of Cast Steel. B. B. Guljajew. *Foundry Trade Journal,* v. 103, July 4, 1957, p. 5-10, 12.

Effect of forging, alloying additions, heat treatment on mechanical properties of cast steel; influence of defects on mechanical properties and relation of defects to deoxidation; speed of solidification, feeding method and mold design.
(Q general, E25n; ST, 5-10)

804-Q. Damping Behavior of Quenched Aluminum-Copper-Magnesium-Silicon Alloys. K. M. Entwistle. *Institute of Metals, Journal,* v. 85, June 1957, p. 425-430.

Damping measurements made on a range of aluminum-copper-mag-

nesium silicon alloys quenched from solution treatment temperatures; damping changes took place in supersaturated quaternary alpha phase and associated relaxation strength increased progressively with degree of supersaturation. 8 ref. (Q8; Al, *Cu, Mg, Si*)

805-Q. Effects of Solid Environments on the Brittle Fracture of Zinc Single Crystals. L. C. Weiner and M. Gensamer. *Institute of Metals, Journal,* v. 85, June 1957, p. 441-448.

Tensile tests carried out on both clean and coated zinc single crystals followed effects of copper, gold, tin and zinc oxide coatings; effects of prestrain, of recovery and of film removal on tensile properties and metallographic structure; experimental observations explained in terms of dislocation pile-up model and modification of dislocation path by twins. 38 ref. (Q26, M26b; Zn, 14-11)

806-Q. How Defects Affect Tensile Strength of Light Alloy Castings. Herman Mansfield. *Iron Age,* v. 180, July 4, 1957, p. 75-77.

Investigates correlation between defects indicated by X-ray and tensile strength of aluminum-base and magnesium-base alloys. (Q27a; Al, Mg, 5-10, 9)

807-Q. Higher Vanadium Improves Hot Strength of Low Alloy Steel. Paul Shahinian and J. R. Lane. *Iron Age,* v. 180, Aug. 1, 1957, p. 91-95. (CMA)

The higher vanadium content results, to some extent, in a better alloy, but this advantage is balanced by the necessity of using higher normalizing temperatures. Properties examined included rupture strength, creep strength and ductility; graphs indicate creep and rupture strengths of the seven melts studied. (Q3m, 2-10; AY, *V*)

808-Q. Brittle Fracture of Mild Steel. Leslie Aitchison. *Iron and Coal Trades Review,* v. 174, May 31, 1957, p. 1273-1275.

Survey of present knowledge on brittle fracture and suggestion of suitable alloying as a cure. (Q26s, 2-10; CN)

809-Q. Effect of Stress on Creep at High Temperatures. H. Laks, C. D. Wiseman, O. D. Sherby and J. E. Dorn. *Journal of Applied Mechanics,* v. 24, June 1957, p. 207-213.

Effects of variables in stress and strain on activation energy for high-temperature creep of aluminum and its dilute alloys. Creep-rate equation for a constant structure. Theory of dislocation-climb for high-temperature creep. 14 ref. (Q3m, Q3n, 2-12; Al)

810-Q. A Statistical Appraisal of the Prot Method for Determination of Fatigue Endurance Limit. W. A. Hijab. *Journal of Applied Mechanics,* v. 24, June 1957, p. 214-218.

Comparison of relative efficiency of Prot method with staircase and probit methods. Derivation of general formula. 12 ref. (Q7, 1-4)

811-Q. Low-Temperature Deformation of Copper Single Crystals. T. H. Blewitt, R. R. Coltman and J. K. Redman. *Journal of Applied Physics,* v. 28, June 1957, p. 651-660.

Observations at 4.2 and 77.3° K. Presence and absence and effects of reactor irradiations on discontinuous slip and twinning. (Q24, 2-13, 2-17; Cu, 14-11)

812-Q. Study of Temper-Brittleness in Cr-Mn Steel Containing Large Amounts of Molybdenum, Tungsten and Vanadium. A. E. Powers. *Journal of the Iron and Steel Institute,* v. 186, July 1957, p. 323-328.

Susceptibilities determined for a 1% Cr, 1% Mn steel to which was added up to 2% molybdenum, 4% tungsten, 1½% vanadium, and combinations of these elements. Combination of molybdenum and vanadium resulted in less susceptibility than either element alone. Theory for mechanism of temper brittleness is given. 22 ref. (Q26s, AY, *Cr, Mn*)

813-Q. Component Fatigue Analysis for Maintenance. R. J. Laux. *Mechanical Engineering,* v. 79, July 1957, p. 656-658.

Fatigue failures in stressed machine parts; methods used in combatting fatigue failures and portable equipment for vibration analysis. (Q7, 1-3)

814-Q. Ductility of Molybdenum. *Metal Industry,* v. 91, July 5, 1957, p. 6, 12.

Effects on transition temperature of molybdenum of following alloying additions: aluminum, boron, cerium, thorium, titanium, vanadium and zirconium. (Q23p, 2-10; Mo)

815-Q. Mechanical Properties of C355 Aluminum Casting Alloy. T. H.

Owen and L. E. Marsh. *Metal Progress,* v. 72, Aug. 1957, p. 78-83.

This high-purity, low-iron alloy, adequately degassed, will have elongation 100% better than standard 355 alloy at equal ultimate and yield or, when elongation is equal the ultimate and yield of C355-T 62 are 25 to 30% higher than 355-T 6. (Q27a, E25s, J27a, 1-10; Al)

816-Q. New Magnesium Alloys for High Temperatures. T. E. Leontis. *Metal Progress,* v. 72, Aug. 1957, p. 97-103.

Addition of thorium up to 4% (in combination with Zr, Mn and Zn) produces magnesium castings, sheet and extrusions of superior short-time tensile properties up to 800 or 900° F., markedly better creep resistance up to 700° F., and raises the temperatures limit of utility above 600° F. as well as extends the range of applications in the 300 to 500° F. range. (Q general, 2-12, 2-10; Mg, *Th,* AD-n, AD-q)

817-Q. Hille-Wallace Sheet-Metal Testing Machine. J. R. Wallace. *Sheet Metal Industries,* v. 34, May 1957, p. 343-344, 348.

Description of sheet metal testing machine with mechanical drive and hydraulic blank holder designed for 2-in. Swift forming test and adaptable to other forms of sheet metal testing such as stretch-forming tensile expanding hold; operation of the machine. (Q23q, 1-3; 4-3)

818-Q. A Power-Operated Press for the Swift Cup-Forming Test. E. Coupland. *Sheet Metal Industries,* v. 34, May 1957, p. 345-347.

Cup drawing press is small double action press with hydraulically controlled main ram and pneumatically controlled pressure plate; press operation. (Q23q, 1-3; 4-3)

819-Q. Prediction of the Cupping Properties of Sheet Metals by the Use of Ultimate Tensile Strength. Emerson N. Ludington. *Sheet Metal Industries,* v. 34, July 1957, p. 485-490.

Investigates aluminum, titanium, brass, copper, zirconium and stainless steels under cupping conditions which give load below maximum value. Result indicates straight-line relationship between load and percentage reduction; gives equation for maximum cupping load taking into account tensile strength, material thickness, and cup diameter. 10 ref.
(Q23q, Q27a; Al, Ti, Cu, Zr, SS, 4-3)

820-Q. Brittle Fracture of Mild Steel. Leslie Aitchison. *Sheet Metal Industries,* v. 34, July 1957, p. 523-525.

Present state of knowledge on the nature of brittle fracture; origin and propagation of cracks; relation of notched-bar value at different testing temperatures and influence of manganese and nickel content on brittle fracture. (Q26, 2-10; CN)

821-Q. Fatigue Properties of Welds. J. G. Whitman. *Sheet Metal Industries,* v. 34, July 1957, p. 529-538.

Factors responsible in reduction of fatigue strength of a welded joint; information on fatigue strength of butt and fillet welds of mild steel, high-tensile steel, aluminum alloys. Fatigue strength of spot welds in aluminum alloys and steels, application of fatigue to design, and improvement in fatigue strength by various treatments. 12 ref.
(Q7a; Al, ST; 7-1)

822-Q. Tool Steels. Pt. 3. L. F. Spencer. *Steel Processing and Conversion,* v. 43, July 1957, p. 372-379, 402-403.

Factors in selection of toolsteels for cold working operations involving a shearing action, a bending action, plastic flow under tensile loading or operations which involve compression; considers dimensional stability during heat treatment, hardenability, toughness, wear resistance, machinability, hot hardness, depth of hardness, susceptibility to decarburization and quenching media for toolsteels. (Q general, P10d, J5; TS)

823-Q. Structural Steels. A Preliminary Investigation of the Relation of Hot Tensile Properties to: (a) Composition and State of Deoxidation, and (b) Weldability. W. G. Beynon. *Welding and Metal Fabrication,* v. 25, July 1957, p. 262-264.

Series of rolled steels with varied aluminum and nitrogen contents was tested. Suggested that weld metal should have greater hot ductility and less hot strength than the material to be welded to reduce hot cracking.
(Q27a, 2-12, K9s; ST, SGB-s)

824-Q. Residual Elements in Steel. James W. Halley. Lecture no. 3 of "Effect of Residual Elements on the Properties of Metals." Amercian Society for Metals, p. 71-87.

Beneficial and detrimental effects on steel of copper, phosphorus, nitrogen, molybdenum, manganese, chromium and hydrogen. 11 ref.
(Q general, 2-10; ST)

825-Q. Newer Metals—Titanium, Zirconium, Molybdenum and Chromium. D. J. McPherson. Lecture no. 5 of "Effect of Residual Elements on the Properties of Metals." American Society for Metals, p. 133-210.

Effects of trace impurities on physical and mechanical properties, transformation kinetics, welding and machining. 74 ref.
(Q general, P general, 3-19; Ti, Zr, Mo, Cr)

826-Q. Creep of Nodular Cast Iron. V. S. Ivanova and I. A. Oding. *Izvestiya Akademii Nauk, OTN,* no. 7, 1955, p. 89-92. (*Henry Brutcher Translation* no. 3767.)

Previously abstracted from original. See item 1037-Q, 1956.
(Q3, M27; CI-r)

827-Q. Effect of Small Quantites of Certain Alloying Elements Upon Temper Brittleness. I. E. Kontorovich. *Fizika Metallov i Metallovedenie,* v. 3, no. 3, 1956, p. 553-555. (*Henry Brutcher Translation* no. 3994.)

Literature data on presumable nature of effect of low aluminum contents in structural steels on their susceptibility to temper brittleness. Beneficial influence of beryllium on temper embrittlement in range from 480 to 750° F.; effects of 0.001, 0.01, 0.1 and 0% Be on impact values of 0.35% C, 1.2% Cr steel at different tempering temperatures; similarity to effect of Al; results of experiments on effect of 0.1 to 1.0% Ti or Cb.
(Q26s, 2-10; AY, *Al, Ti, Cb*)

828-Q. (German.) **Tendency to Embrittlement of Steels as Dependent on the Stress Condition and Temperature.** Albert Kochendörfer and Herbert Scholl. *Stahl und Eisen,* v. 77, July 25, 1957, p. 1006-1018.

Shapes of test bars examined and multi-axiality figures; yielding and rupturing stress as dependent on the multi-axiality figure and temperature; representation of this depenency in three-dimensional diagrams; brittle fracture temperature and transition temperature as dependent on stress condition; arrangement of the results of notched bar impact tests; conclusions to be drawn for testing tough or brittle fracture behavior. (Q26s, Q6, 1-4; ST)

829-Q. (German.) **Strain Gages and the Testing of Materials.** Walter Köhler. *Werkstoffe und Korrosion,* v. 8, July 1957, p. 389-393.

Strain gages are used for static tensile strength testing by checking the accuracy and the linearity of indication under single and multiple stress in the elastic range. 12 ref.
(Q27a, 1-3, W28h)

830-Q. (Italian.) **Influence of the Shape of Samples on the Fatigue Resistance of Peraluman 50 Alloy.** F. Gatto. *Alluminio,* v. 24, June 1957, p. 251-254.

Fatigue tests under rotating bending loads were carried out to determine differences between results obtained using cylindrical samples. For the Peraluman 50 (5% Mg aluminium alloy) a difference of 1.0 kg. per sq. mm. of the fatigue limit, equal to 6% was observed. 5 ref.
(Q7c, 1-10; Al)

831-Q. Spring Properties of Titanium and Its Alloys. K. Hojo. *Nippon Telegraph and Telephone Public Corp., Electrical Communication Laboratory, Reports,* v. 5, Feb. 1957, p. 8-11. (CMA)

Spring tests were performed on titanium and the alloys Ti-2Al, Ti-8Mn and Ti-1Fe-3Cr in the form of cold rolled sheet. The spring limit in titanium is increased by degree of cold rolling, and increases with annealing temperature up to a maximum at 400° C. The spring limit for each of the materials noted is given. (Q10; Ti, SGA-b)

832-Q. Mechanical Properties of Zircaloy-2. G. T. Muehlenkamp and A. D. Schwope. *U. S. Atomic Energy Commission,* TID-10016, Oct. 20, 1953, 10 p. (CMA)

Tensile, impact and hot hardness properties of Zircaloy-2 were measured at different temperatures for hydrogen contents up to 410 ppm. Tensile strength is little affected by less than 400 ppm. of hydrogen. Increasing amounts of hydrogen increased the impact transition temperature. Hot hardness and fatigue strength were not affected up to 500° C. (Q general; Zr, *H*)

833-Q. Effect of Irradiation on the Properties of Boron-Stainless Steel Powder Dispersion Samples. J. D. Eichenberg. Westinghouse Electric Corp., *U. S. Atomic Energy Commission,* WAPD-160, Jan. 2, 1957, 27 p.

No gross dimensional change or warpage was produced as a result of the irradiation, and no changes were evident in the microstructure of the samples. The hardness of all the samples increased approximately 175 DPH units and was not dependent on exposure. The results

of the tensile and impact tests indicated that the samples were almost completely embrittled as a result of the irradiation. 4 ref.
(Q general, 2-17; SS)

834-Q. Thermal Buckling. F. V. Pohle and I. Berman. Polytechnic Institute of Brooklyn. (Wright Air Development Center.) *U. S. Office of Technical Services,* PB 121512, May 1956, 37 p. $1.

Uses a simply supported rectangular plate to illustrate the thermal buckling problem in a project aimed at comparing the various methods for determining the characteristic parameter in the buckling problem. Methods are discussed with particular attention to the choice of the most effective method to use in the problem of the thermal buckling of a cylinder. (Q28, 2-12)

835-Q. Notch Sensitivity of Heat-Resistant Alloys at Elevated Temperatures. Pt. 3. Final Data and Correlations. H. R. Voorhees and J. W. Freeman. University of Michigan. (Wright Air Development Center.) *U. S. Office of Technical Services,* PB 121791, Jan. 1956, 88 p. $2.25.

Results indicated that elevated-temperature rupture characteristics of notched specimens under a steady tensile load depend on three factors: distribution and level of the initial stress pattern; the rate at which variable creep rates at different locations in the cross section are able to relax peak stress originally concentrated near the notch; and rupture characteristics of the material at the prevailing stresses and for the prior history experienced by different fibers in the notched bar. (Q3m, 2-12; SGA-h)

836-Q. Dependence of Tension and Notch-Tension Properties of High-Strength Steels on a Number of Factors. Pt. 1. B. B. Muvdi, G. Sachs and E. P. Klier. Syracuse University. (Wright Air Development Center.) *U. S. Office of Technical Services,* PB 121847, Dec. 1956, 66 p. $1.75.

In general, tensile strength was found to be independent of specimen orientation, but to decrease gradually with increase in specimen size. The ductility of smooth specimens, however, was observed to depend on both specimen orientation and specimen size. The notch strength decreased with increase in stress concentration, specimen diameter and as-processed section size. It also decreased as the specimen orientation was changed from longitudinal to transverse.
(Q27a, 1-10; ST, SGB-a)

837-Q. Axial-Load Fatigue Properties of High-Strength Steel. Pt. 2. B. B. Muvdi, G. Sachs and E. P. Klier. Syracuse University. (Wright Air Development Center.) *U. S. Office of Technical Services,* PB 121883, Dec. 1956, 46 p. $1.25.

Tests indicate that the fatigue strength was lowered as the stress-concentration factor was increased, a maximum lowering effect occurring for stress concentration factors between one and three. This effect was observed to depend upon the strength level. The endurance limit for both smooth and notched specimens developed minimum values at a strength level between 240,000 and 260,000 psi., and maximum values at a strength level between 270,000 and 300,000 psi. approximately. In general, the endurance limit was found to be lower for transverse than for longitudinal specimens.
(Q7a; ST, SGB-a)

838-Q. Evaluation of Dry-Film Lubricant Coatings. Pt. 1. W. C. Hart. (Wright Air Development Center.) *U. S. Office of Technical Services,* PB 121922, Sept. 1954, 29 p. 75c.

The most successful types of dry film lubricants have excellent properties for plain bearing applications at low speeds. Materials studied were commercial baked resin-bonded films and spray can coatings with graphite or molybdenum disulphide, experimental baked resin-bonded films with molybdenum disulphide and a variety of resin bases, and air-drying coatings applied by dipping. (Q9p; NM-h)

839-Q. Retainer Materials for Aircraft Gas-Turbine Bearings. P. F. Mataich and F. C. Wagner. Horizons, Inc. (Wright Air Development Center.) *U. S. Office of Technical Services,* PB 121935, Aug. 1956, 34 p. $1.

Developmental work concentrated on various boride, carbide and silicide additions to a silver-infiltrated nickel matrix produced by powder metallurgy. The borides were found to have the best properties. A 7% chromium boride addition was best among several compositions with superior wear characteristics.
(Q9n, T7d; Ni, *Ag,* 6-21)

840-Q. Improving Fatigue Life of Formed Stainless Steel Hydraulic Tubing by Prestressing. C. S. Yen and B. V. Whiteson. Douglas Aircraft Co., Inc. (Wright Air Development Center.) *U. S. Office of Technical Services*, PB 121969, May 1956, 57 p. $1.50.

Results showed that the higher the prestressing pressure the greater were fatigue life and tube permanent deformation. Prestressing brought a weight saving of 12 to 35% in formed tubes designed for a given power transmission and for survival of one-million cycles of constant pressure pulsing.
(Q7a, G23q; ST, 4-10)

841-Q. Dynamic Stress Distribution Surrounding a Running Crack. A Photo-Elastic Analysis. A. A. Wells and D. Post. Naval Research Laboratory. *U. S. Office of Technical Services*, PB 121987, Apr. 1957, 29 p. $.75.

Dynamic stress distributions in the vicinity of the crack approximated static distributions in models extended at their ends by a fixed displacement. At greater distances from the crack the distributions approached those for constant load during fracture. For the crack unaffected by the pressure of external plate edges, the surrounding zone of stress-and-strain disturbance grows in all directions proportionally to crack length. (Q25, W28p, 1-2)

842-Q. Interrelation of Fatigue Cracking, Damping and Notch Sensitivity. L. J. Demar. University of Minnesota. (Wright Air Development Center.) *U. S. Office of Technical Services,* PB 131025, Mar. 1957, 164 p. $4.25.

Results of numerous fatigue tests performed on a variety of metallic materials in which observations were made of the changes in damping and stiffness properties of the specimens and of the development of fatigue macrocracks. Test results are discussed in relation to previous investigations, and new relations between dynamic properties of materials are evolved. (Q7, Q8, Q23s)

843-Q. Studies of Factors Affecting Thermal Stability of Titanium-Base Alloys. F. C. Holden, H. R. Ogden and R. I. Jaffee. Wright Air Development Center, Technical Report 56-597. *U. S. Office of Technical Services,* PB 131043, Feb. 1957, 62 p. (CMA)

A study showed that thermal stability was good in Ti-6Al-4V, Ti-155A and C-130AM under creep exposure tests through 800° F. The alloys were in three heat treated conditions. The last two alloys showed some loss of ductility. A study of the effects of nickel, copper and chromium additions on the thermal stability of Ti-5Cr-5Mo showed that they were detrimental; manganese, molybdenum and aluminum additions were beneficial. Small amounts of strain applied before equilibration or after stabilization had no significant effect. (Q general, 2-12; Ti)

844-Q. Notch Toughness of Weld Deposits in Commercial Titanium Alloys. D. M. Daley, Jr., and C. E. Hartbower. Watertown Arsenal Laboratory, Report 401/221. *U. S. Office of Technical Services,* PB 131109, July 1956, 31 p. (CMA)

Sigma welds on commercial titanium, Ti-7Mn and Ti-4Cr-2Fe were tested for weld metal toughness through a range of temperatures, using the V-notch Charpy impact test. (Q6n; Ti, 7-1)

845-Q. Room Temperature Tensile Properties of Several Titanium Alloys After Being Heated in Argon at Temperatures of 1400-1800° F. W. H. Duffy. Watertown Arsenal Laboratory, Report 401/219. *U. S. Office of Technical Services,* PB 131110, July 1954, 36 p. (CMA)

After heating titanium, Ti-8Mn, Ti-4Al-4Mn and Ti-2.7Cr-1.3Fe in argon for 24 hr. in the 1400 to 1800° F. range, the furnace-cooled or air-cooled samples were subjected to tensile tests. The effect on microstructure of the heat treatment was determined by etching and microscopy. (Q27a, 2-14; Ti)

846-Q. Investigation of Mechanical Properties of Metal-Arc Welded Ti-6% Al-4% V. D. M. Daley, Jr. and C. E. Hartbower. Watertown Arsenal Laboratory, Report 401/250. *U. S. Office of Technical Services,* PB 131114, Sept. 1956, 18 p. (CMA)

Ti-6Al-4V as welded gives satisfactory properties when using matching filler. Tensile joint efficiency was about 100% with an ultimate strength of 150,000 psi. The heat-affected zone had a notch toughness greater than any other commercial alpha-beta titanium alloy tested. (Q general; Ti, 7-1)

847-Q. Some Wear Characteristics of Titanium. H. F. Campbell. Wa-

tertown Arsenal Laboratory, Report 401/234. *U. S. Office of Technical Services,* PB 131113, Mar. 1956, 18 p. (CMA)

Reciprocating sliding wear tests on combinations of titanium with silver, steel, Monel and Babbitt metal were conducted, with and without lubricant. Bearing pressures of 500 psi. were used with Babbitt metal and 2500 psi. pressures for the others. Wear was determined visually and by computing weight loss. (Q9n; 1-4; Ti)

848-Q. Study of Deformability of Technical Iron in the As-Cast State. G. N. Mekhed. *Metallovedenie i Obrabotka Metallov,* Aug. 1956, p. 43-47. (*Henry Brutcher Translation* no. 3970.)

Investigation of effect of testing temperature on ductility of industrially and laboratory-melted technical irons in the as-cast state; usefulness of various mechanical tests for revealing susceptibility to embrittlement; ductility of rimmed as against killed technical irons; effect of sulphur and oxygen contents on ductility at 850-1050° C.; effect of manganese content; determination of ranges of cold shortness, blue-shortness and red-shortness. (Q23p; CI)

849-Q. Effect of Metallurgical Factors Upon Temper Brittleness. S. M. Baranov. *Metallovedenie i Obrabotka Metallov,* no. 12, 1956, p. 40-45. (*Henry Brutcher Translation* no. 4013.)

Study of relationship between melting practice and structure and properties of steel. Importance of formation of silicon monoxide for occurrence of reversible and irreversible temper brittleness. Principles of melting steel so as to be free from temper brittleness. (Q26s; ST)

850-Q. Variation of Mechanical Properties of Vacuum Melted and Vacuum Cast Steel Ingots in Different Directions. Ya. B. Gurevich. *Stal',* v. 16, no. 9, 1956, p. 815-817. (*Henry Brutcher Translation* no. 4017.)

Previously abstracted from original. See item 1050-Q, 1956. (Q general, D8, 1-23; CN, AY)

851-Q. (French.) **Contribution to the Study of the Embrittlement of Alpha Steels by Cold Introduction of Hydrogen and the Diffusion of Hydrogen in These Steels.** P. Amiot. *Institut de Recherches de la Sidérigie, Publications,* Ser. A, no. 158, April 1957, 80 p.

Pt. 1: Influence of hydrogen on mechanical properties of low-alloy steels: tensile tests and hydrogen-induced brittleness; influence of cold working on hydrogen-induced brittleness; deferred fractures in presence of cathodic hydrogen. Pt. 2: Diffusion of hydrogen in steels at atmospheric temperature: potentiometric measurements; volumetric measurements. 67 ref. (Q26s, Ni; ST, *H*)

852-Q. (French.) **Study of the Shape of Curves Produced by Plastic Deformation.** B. Jaoul. *Journal of the Mechanics and Physics of Solids,* v. 5, Mar. 1957, p. 95-114.

Precise analysis of shape of tensile test curves permits definition of four mechanisms of deformation which appear in succession and correspond to different laws of strain hardening: pseudo-elastic deformation, where all slip is reversible; intergranular hardening, where some slip is still reversible; linear intercrystalline strain hardening, up to a transition point beyond which the rate of increase of work hardening diminishes. Respective ranges of each of these phases is strongly influenced by nature of the metal, its purity and testing temperatures. Certain phases can disappear and the four may not be observable simultaneously except under special conditions. 21 ref. (Q24)

853-Q. (German.) **Hardness Tests With Indentation Depth Gaging Using the Diamond Pyramid.** H. Mäkelt. *Werkstatt und Betrieb,* v. 90, July 1957, p. 444-446.

In the Vickers hardness testing method the indentation depth of the test sample may be used for the determination of hardness. The indentation hardness will also provide data for determining permanent stress and supply information regarding the permissible surface pressure for friction bearing materials. (Q29c)

854-Q. (German.) **Strength of Titanium Welded Joints.** K. Bungardt and K. Rüdinger. *Zeitschrift für Metallkunde,* v. 48, June 1957, p. 335-340. (CMA)

Welded joints on titanium sheets 10 and 22 mm. thick were investigated with regard to mechanical properties (tensile strength, impact strength, fatigue), corrosion resistance and gas absorption (during welding). The observations were made both on the joints and on the neighboring parts of the welded

sheets. 14 ref.
(Q27a, Q6n, Q7a, R general; Ti, 7-1)

855-Q. (Italian.) **Characteristics of Metals and Alloys of Interest to Machinery Builders and Foundrymen.** Plinio Corbellini. *Fonderia,* v. 6, May 1957, p. 197-199.

Table of physical characteristics of 21 types of steel, cast iron and alloys used in machine construction; factors influencing cost and ease of machining; weldability, hardness and mechanical shock resistance as selection criteria.
(Q general, W general; ST, CI, 17-7)

856-Q. (Japanese.) **Study of Young's Modulus of Cast Metals.** Toshimasa Morooka. *Casting Institute of Japan, Journal,* v. 29, Apr. 1957, p. 235.

Effect on Young's modulus of the addition of silicon to aluminum-silicon alloys; comparison of metal mold castings and sand mold castings; the relation between annealing time and Young's modulus. (Q21a, 2-10, 2-14; Al, *Si,* 5-10, 5-13)

857-Q. (Japanese.) **Abrasion Resistance of Ductile Cast Iron.** Yasuhiro Nakagawa. *Casting Institute of Japan, Journal,* v. 29, Apr. 1957, p. 241-242.

Determination of abrasion resistance of gray cast iron, steel and ductile cast iron at different speeds by an abrasion testing machine; comparison of abrasion resistance with and without oil. (Q9n; CI-r)

858-Q. (Japanese.) **Characteristics of High-Quality Cast Iron. Report 1.** Kisao Abe. *Casting Institute of Japan, Journal,* v. 29, Apr. 1957, p. 254-256.

General mechanical properties, tensile strength, fatigue, corrosion, thermal growth and gas contents of alloy cast iron in relation to cupola operation. (Q general, E10a; CI)

859-Q. (Japanese.) **Galvanizing Embrittlement in Cold Bent Steel Pipes.** Hideo Kimizuka, Yoshio Shimokawa and Morio Nakajima. *Sumitomo Metals,* v. 9, Jan. 1957, p. 5-12.

Causes of brittleness in the galvanized pipe bends. Strain aging plays an important part in embrittlement. Pipes are not so brittle immediately after cold bending, but become brittle by heating at low temperature even if not galvanized. Most effective remedy is to anneal after bending.
(Q26s, G6, 1-17; ST, 4-10)

860-Q. (Japanese.) **Flaring Test and Flattening Test for Steel Tubes.** Toyohiko Okamoto. *Sumitomo Metals,* v. 9, Jan. 1957, p. 21-30.

Influence of the tube size and the tool angle on the tests. The maximum expansion of flaring test increases with increased thickness of tubes. The influence of the angle of tools used for expanding is not important but the maximum expansion increases slightly with increased angle. On the flattening of thin-walled tubes, cracks and breaks occurred at the free outside surface of tubes, but on thick-walled tubes, these occurred at the inner surface of the part in contact with parallel plate. (Q3q, 1-4; ST, 4-10)

861-Q. (Portguese.) **Selection of Carbon Steel Bars. Pt. 2.** Waldemar de Lima e Silva. *Engenharia, Mineracao e Metalurgia,* v. 25, Mar. 1957, p. 125-126.

Composition, characteristics of rimmed, killed, semikilled and capped steels; real and apparent grain size; effects of heat treatment on grain size; 12 classes of carbon steel; their composition and workability.
(Q general, M27c; CN, 4-5)

862-Q. (Russian.) **Wearing Quality of Carbon and High-Chromium Steels.** D. Y. Vishniakov and A. G. Vinitzki. *Metallovedenie i Obrabotka Metallov,* no. 4, Apr. 1957, p. 2-9.

Samples were subjected to chemical, magnetic, physical and X-ray analysis. Tests showed that wear resistance increases with the quantity of carbides present in the samples. The resistance of carbon steels to the cutting action of abrasives rises if the cementite particles in the form of thin flakes is dispersed between flakes of ferrite. 5 ref. (Q9n; CN, AY, *Cr*)

863-Q. (Russian.) **Influence of Carbon on the Critical Interval of Cold Brittleness.** A. P. Gulyaev and N. P. Neverova-Skobeleva. *Metallovedenie i Obrabotka Metallov,* no. 4, Apr. 1957, p. 17-21.

Carbon in different quantities affects brittleness under varying temperatures, quenching and cooling conditions. Critical temperature affecting brittleness falls off rapidly with the increase in carbon content. (6 ref. (Q26s, 2-10; ST)

864-Q. (Russian.) **Nature of Thermal Brittleness.** A. S. Zavyalov, L. R.

Goldstein and M. I. Senchenko. *Metallovedenie i Obrabotka Metallov,* no. 4, Apr. 1957, p. 21-30.

Impact strength of alloy steel varies greatly between −150 and +50° C. Above that it is almost constant to 200° C. Presence of phosphorus shows marked influence on the impact strength of chromium-molybdenum steel. 10 ref. (Q26s, Q6n; AY, *Cr, Mo*)

865-Q. (Russian.) **Influence of Secondary Hardening in the Mid-Critical Interval on the Propensity of Certain Steels Toward Temper Brittleness.** B. G. Sazonov. *Metallovedenie i Obrabotka Metallov,* no. 4, Apr. 1957, p. 30-34.

Influence of heat treatment on the inclination of certain alloy structural steels toward temper brittleness. After secondary hardening between the upper and lower critical temperatures steels are free of temper brittlenss. (Q26s, 2-14)

866-Q. (Russian.) **Mechanical Characteristics of Steel Deformed at High Temperatures.** E. N. Moshnine and D. I. Berezhkovshy. *Metallovedenie i Obrabotka Metallov,* no. 4, Apr. 1957, p. 35-41.

Apart from temperature, the speed of deformation, length of heating, aging, uniformity of heating, also affect the mechanical properties of steel. Since little is known of the behavior of steel under heated conditions hot steel samples were exposed to various stresses. 5 ref. (Q general, 2-12, 3-18; ST)

867-Q. (Russian.) **Influence of Residual Austenite on the Properties of Steels.** E. I. Malinkina. *Metallovedenie i Obrabotka Metallov,* no. 4, Apr. 1957, p. 44-47.

The claim that the toughness of toolsteels regularly depends on the quantity of residual austenite in martensite is challenged. 4 ref. (Q general, M27; TS)

868-Q. (Russian.) **Best Chemical Composition of Stainless Steel IXI8H9T.** M. I. Vinogradov. *Metallurg,* v. 2, May 1957, p. 13-16.

Discussion of stainless steel properties in respect to titanium contents. Recommendations are given for variations from the standard formula, in particular for pipe and sheet steels.
(Q general, 2-10; ST, *Ti*)

869-Q. (Russian.) **Reason for Variations of Steel Ductility at High Temperatures.** M. I. Vinograd. *Stal',* v. 17, Mar. 1957, p. 254-260.

In certain cases, the negative influence of the oxygen content in the metal on its ductility at high temperatures may be explained by the formation of easily fusible dispersed inclusions (films) containing silicon oxide. 4 ref. (Q23p, 2-10; ST, *O*)

870-Q. (Russian.) **Compression and Geometry of Deformation.** V. L. Raskind. *Vestnik Mashinostroenia,* v. 37, Jan. 1957, p. 55-58.

The formula for computation of the work of compression is based on the assumption that the volume of the billet remains constant on compression. Actually the billet assumes a barrel-like shape. Therefore, a new formula which takes into consideration the billet deformation is proposed. (Q28)

871-Q. (Russian.) **Resistance to Seizing of Stainless Steel.** B. Kh. Somin and C. L. Matzkevitsh. *Vestnik Mashinostroenia,* v. 37, Mar. 1957, p. 28-34.

General discussion of seizing of stainless steel shaft; 18 steel brands are investigated to determine the cause and remedy; four different types of lubricants are considered; best result is obtained by sand blasting of the shafts followed by phosphatizing and coating with a polyvinyl lacquer. 5 ref. (Q9n; SS)

872-Q. (Russian.) **Nature of Bright Areas on Friction Surfaces of Steel.** N. V. Seleznev, I. E. Brainin and P. I. Kuleshov. *Vestnik Mashinostroenia,* v. 37, Mar. 1957, p. 35-39.

Several hypotheses regarding microcrystalline changes of steel friction surfaces. Shows that the first part is bright; the second, dark; the third is intermediate and is only slightly harder than the metal itself. X-ray analysis confirms presence of austenite, martensite and cementite in the dark layer. As the surface temperature reaches 850° C. on friction without lubricant, some diffusion of carbon takes place. 8 ref. (Q9p, M27; ST)

873-Q. **Internal Friction of Beta-Brass.** L. M. Clarebrough. *Acta Metallurgica,* v. 5, Aug. 1957, p. 413-426.

Internal friction of polycrystals and single crystals investigated by method of low-frequency, free, torsional vibration. Six separate anelastic phenomena detected by varying composition and heat treatment of specimens. Interpretation of results in terms of Zener's pair-reori-

entation mechanism, stress relation at interfaces. 26 ref. (Q22, Cu-n)

874-Q. Stacking Faults by Low-Temperature Cold Work in Copper and Alpha Brass. C. N. J. Wagner. *Acta Metalurgica,* v. 5, Aug. 1957, p. 427-434.

Deformation faulting and twin faulting probabilities in terms of zinc content and filing temperature. 13 ref. (Q24, 2-13; Cu-n, *Zn*)

875-Q. X-Ray Study of the Plastic Deformation in Zinc Single Crystals. C. T. Wei. *Acta Metallurgica* v. 5, Aug. 1957, p. 435-442.

By use of Schulz techniques elliptical ring-shaped imperfections detected near crystal surface. Possible mechanisms for formation discussed. 9 ref. (Q24, M26s; Zn, 14-11)

876-Q. Impact Properties of Quenched and Tempered Alloy Steels. John P. Sheehan and Harry Schwartzbart. *American Society for Testing Materials, Proceedings,* v. 56, 1956, p. 483-520.

All steels tested exhibited A-brittleness (500° F. embrittlement); the 2300 series exhibited B-brittleness (developed by a tempering temperature of 1200° F.). Addition of molybdenum minimizes temper brittleness (developed by a tempering temperature of 950 to 1150° F.). 12 ref. (Q6n, Q26s, 2-10; AY, *Mo*)

877-Q. Crack Initiation and Propagation in the V-Notch Charpy Impact Specimen. Carl E. Hartbower. *American Society for Testing Materials, Proceedings,* v. 56, 1956, p. 521-539.

Two approaches were investigated. Both involved the initiation of a crack by means of an initial low-energy blow of the impact-machine pendulum. The first method determined the highest temperature at which the initial low blow caused complete fracture of the test specimen, that is, the temperature at which the low blow initiated a crack which then propagated by continuous release of the elastic stress field developed by the initial low blow. The second method required the measurement of lateral expansion after the crack-initiating low blow and again after a second, fracturing blow. 9 ref. (Q6, 1-4, Q26q)

878-Q. Tensile Study of the Brittle Behavior of a Rimmed Structural Steel. E. T. Wessel. *American Society for Testing Materials, Proceedings,* v. 56, 1956, p. 540-554.

The factors involved in the initiation of a brittle (cleavage) failure in a rimmed structural steel were investigated using notched and unnotched tension tests at temperatures down to −269° C. Cleavage fractures which occurred at all temperatures below 100° C. were preceded by plastic deformation. 11 ref. (Q26s, Q27, 2-13; ST-d)

879-Q. Correlation of Torsional and Tensile Prestrain Effects on Fracture Properties. I. Rozalsky. *American Society for Testing Materials, Proceedings,* v. 56, 1956, p. 621-644.

A correlation of the effects of room-temperature tensile and torsional prestrain upon the tensile fracture properties of annealed copper and spheroidized S.A.E. 1020 steel at various test temperatures from + 75 to − 321° F. 19 ref. (Q27a, Q1b, 2-11; CN, Cu)

880-Q. Effect of Brittle Skins on the Ductility of Metals. G. W. Form and W. M. Baldwin, Jr. *American Society for Testing Materials, Proceedings,* v. 56, 1956, p. 645-661.

Brittle skins (for example, carburized cases) embrittle an otherwise ductile metal to a greater degree than would be anticipated by the percentage of bulk that the skin occupies. 25 ref. (Q26s, Q23p)

881-Q. Notch Tensile Behavior of Face Centered Cubic Metals. E. J. Ripling. *American Society for Testing Materials, Proceedings,* v. 56, 1956, p. 662-671.

The notch insensitivity of face-centered cubic metals when tested at a constant rate and testing temperature was found to be a linear function of the unnotched strain hardening exponent. 6 ref. (Q23s)

882-Q. Effect of Geometry on the Properties of C4A-T6 and SG70A-T6 Aluminum-Alloy Castings. W. H. Johnson and H. F. Bishop. *American Society for Testing Materials, Proceedings,* v. 56, 1956, p. 724-737.

Tensile properties were determined at various locations in aluminum alloy (C4A-T6 and SG70A-T6) castings of different thicknesses and geometries and compared with properties obtained from separately cast test bars. 3 ref. (Q27a, 3-23; Al, 5)

883-Q. Notch and Smooth Bar Stress-Rupture Characteristics of Several Heat-Resistant Alloys in the

Temperature Range Between 600 and 1000° F. J. G. Sessler and W. F. Brown, Jr. *American Society for Testing Materials, Proceedings*, v. 56, 1956, p. 738-755.

Moderately elevated-temperature rupture strength of modified ferritic steels can be considerably increased by heat treating to higher strength levels. However, a practical strength limitation appears to exist in that there is a progressive development of notch rupture sensitivity as the strength level is increased. 10 ref. (Q3q; SGA-h)

884-Q. Influence of Hot-Working Conditions on the High Temperature Properties of Heat-Resistant Alloys. J. F. Ewing and J. W. Freeman. *American Society for Testing Materials, Proceedings*, v. 56, 1956, p. 756-788.

The relationship between conditions of hot working and properties at high temperatures were investigated for a solution-strengthened 20 Cr, 20 Ni, 20 Co, 3 Mo, 2 W, 1 Cb alloy. Medium to low strengths will result when large reductions are made at nearly constant high temperatures. Very high strengths at 1200° F., and relatively high strengths at 1500° F. are characteristic of gradual reductions over a decreasing temperature range. (Q27a, 2-12, 3-18; SGA-h)

885-Q. Factors Affecting the Forming Properties of Several Copper Alloys in Strip Form. John T. Richards and Ellsworth M. Smith. *American Society for Testing Materials, Proceedings*, v. 56, 1956, p. 807-822.

Bend, tension and hardness tests were performed on beryllium copper, phosphor bronze, brass, nickel-silver and gilding strip to determine relative forming characteristics. Formability is expressed as the minimum gage radius for cold forming a 90° bend. 5 ref. (Q23q; Cu)

886-Q. Autographic Bearing-Strength Test, and Typical Test Values on Some Magnesium Alloys at Room and Elevated Temperatures. A. A. Moore and J. A. Gusack. *American Society for Testing Materials, Proceedings*, v. 56, 1956, p. 834-841.

A simplified method of measuring hole elongation in the bearing testing of metals, some of the variables and problems encountered in making a bearing test. Bearing properties of some magnesium alloys at room and elevated temperatures. 6 ref. (Q9, Q27a, 1-4; Mg)

887-Q. Evaluation of Test Variables in the Determination of Shear Strength. Raymond W. Fenn, Jr., and Robert B. Clapper. *American Society for Testing Materials, Proceedings*, v. 56, 1956, p. 842-858.

Study of extensive new single shear, double shear and punch shear test results reveals a significant size effect which must be considered in any attempt to compare shear strengths of alloys. (Q29, 1-4, 3-23)

888-Q. Creep-Rupture Tests in Shear of Cast Antimony-Lead Alloys. J. Neill Greenwood. *American Society for Testing Materials, Proceedings*, v. 56, 1956, p. 858-865.

A creep-rupture test has been developed in which a cylindrical pin of the alloy is sheared. The pins were machined from cast bars. Tests have been carried out over a temperature range from 0 to 100° C. on alloys containing up to 11% antimony. A specially refined industrial lead (AAG) was used as the basis of the alloys. (Q3, 1-4; Pb, *Sb*)

889-Q. Fretting Wear of Zircaloy-2 Pellets in High-Temperature Water. L. A. Waldman and P. Cohen. *American Society for Testing Materials, Proceedings*, v. 56, 1956, p. 891-902. (CMA)

Pellet bed reactors using Zircaloy-2 cladding were studied under fully simulated operating conditions. The fretting rate is 4.1 mg. per sq. dm. per month and is not serious with respect to clad integrity or activity levels reached in the primary system. (Q9q, R4, 2-12; Zr)

890-Q. Mechanical Properties of Type-201 Chromium-Nickel-Manganese Stainless Steel Sheet. R. A. Walsh, R. L. Cook and R. A. Lula. *American Society for Testing Materials, Proceedings*, v. 56, 1956, p. 923-944.

Tensile and compressive properties were determined for two commercial heats of Type-201 sheet with cold reduction from 0 to 60%. (Q27a, Q28g; SS, *Cr, Ni, Mn*)

891-Q. Effect of Size, Shape and Grain Size on the Fatigue Strength of Medium Carbon Steel. Ch. Massonnet. *American Society for Testing Materials, Proceedings*, v. 56, 1956, p. 954-978.

Experimental data about the size and notch effects, in relation to the improvement of the design of machine parts. 17 ref. (Q7a, 2-9, 3-23; CN)

892-Q. Fatigue Properties of Comparable Cast and Wrought Steels. E. B. Evans, L. J. Ebert and C. W. Briggs. *American Society for Testing Materials, Proceedings,* v. 56, 1956, p. 979-1011.

Effect of steel composition and heat treatment; effect of surface finish; directionality; section size effect; mass component. 12 ref. (Q7a; ST, 4, 5)

893-Q. Effect of Changing Cyclic Modulus on Bending Fatigue Strength. A. A. Blatherwick and B. J. Lazan. *American Society for Testing Materials, Proceedings,* v. 56, 1956, p. 1012-1037.

By means of hypothetical stress-strain locus curves, an anlysis was made of the effect of changing cyclic properties on stress redistribution and its influence on the fatigue life to be expected for various cross-sectional shapes under different loading conditions. 8 ref. (Q7g, Q7b)

894-Q. Fatigue Crack Propagation in Aluminum Alloys. M. S. Hunter and W. G. Fricke, Jr. *American Society for Testing Materials, Proceedings,* v. 56, 1956, p. 1038-1050.

Metallographic observation of fatigue cracks in aluminum alloys from their inception to final complete failure of the specimen has revealed the manner in which fatigue cracks form, propagate and interact. 7 ref. (Q26q, Q7; Al)

895-Q. Notched Fatigue Properties of Some Titanium Alloys. A. W. Demmler, Jr., M. J. Sinnott and L. Thomassen. *American Society for Testing Materials, Proceedings,* v. 56, 1956, p. 1051-1062. (CMA)

The rotating-beam fatigue life properties were studied for Ti-75A, RC-130B, RC-A110AT, Ti-6Al and Ti-30Mo. Different shapes and preparations of notches were evaluated. Machined notches decrease the fatigue life properties but not to the predicted extent, ground notches decrease them beyond the predicted extent, and a rolled notch appears to remove any effect of reduced strength from the alloys.
(Q7c, 1-10; Ti)

896-Q. Review of Methods Employed in the Statistical Analysis of Fatigue Data. R. Roeloffs and F. Garofalo. *American Society for Testing Materials, Proceedings,* v. 56, 1956, p. 1081-1090.

Variability in fatigue life at a fixed stress level; determination of endurance limit among nominally identical specimens; empirical fitting of S-N curves and fundamental theories of fatigue failure. 23 ref. (Q7b, S12)

897-Q. Study of Statical Treatments of Fatigue Data. M. N. Torrey and G. R. Gohn. *American Society for Testing Materials, Proceedings,* v. 56, 1956, p. 1091-1123.

Summarizes results of reversed-bending fatigue tests on two lots of commercial Grade A (5% tin) phosphor bronze strip and presents the observed values (48 values for each deflection level); the distributions of cycle life are fitted by logarithmic-normal, extreme value and log-log normal distributions, showing that the type of distribution depends on the deflection (stress) value. 30 ref. (Q7, S12; Cu-s, 4-3)

898-Q. Wire Fatigue Machine for Investigation of the Influence of Complex Stress Histories. H. T. Corten and G. M. Sinclair. *American Society for Testing Materials, Proceedings,* v. 56, 1956, p. 1124-1137.

Machine operates on the principle of a deflected rotating strut. This equipment was designed to investigate fatigue life for complex stress histories, particularly those consisting of repeated blocks of cycles. The results of constant stress amplitude tests of steel wire are presented and analyzed statistically. (Q7, 1-3)

899-Q. Tests on I-Section Stanchions Bent About the Major Axis. Jacques Heyman. *British Welding Journal,* v. 4, Aug. 1957, p. 373-384.

Tests were made on three lengths of stanchions. Lateral restraint against bending was provided at the top and bottom to simulate effect of secondary beams framing at right angles to the main beams in actual structure. Longest stanchions behaved in a way that was largely elastic, the shortest behaved as stocky struts, while the intermediate lengths presented the greatest problems of analysis. 12 ref. (Q5g; ST)

900-Q. Low Temperature Properties of Steel Castings. *Castings,* v. 3, June 1957, p. 22-23.

Data on low-temperature impact properties as indicated by Charpy V-notch values for quenched and tempered, plain carbon, low and medium-alloy cast steels.
(Q6n; ST, 5-10)

901-Q. Microporosity in Steel. *Castings,* v. 3, May 1957, p. 25, 27.

Methods for quantitative assessment of microporosity in cast steel and influence of microporosity on mechanical properties.
(Q general, 9-18; ST, 5-10)

902-Q. Hydrogen Absorption, Embrittlement and Fracture of Steel. Arnold E. Schuetz and W. D. Robertson. *Corrosion,* v. 13, July 1957, p. 437t-458t.

Investigation to identify principal cause of failure of alloy steels in corrosive media containing hydrogen sulphide; first part of investigation compared hydrogen sulphide embrittlement with that caused by cathodic charging of hydrogen; investigation of spontaneous fracture under condition of constant deformation as dependent on alloy composition, heat treatment, plastic deformation and chemical environment; hydrogen absorption by iron-nickel alloys from hydrogen sulphide compared to that from sulphuric acid; measured rate of permeation of hydrogen to austenitic, martensitic and ferritic states of iron-nickel alloys. Time dependence of static fracture of iron-nickel alloys as function of applied stress, structure and hydrogen concentration. 43 ref.
(Q26s, R1d, AY, SGA-h)

903-Q. Tensile Properties of Nickel. *Corrosion Prevention and Control,* v. 4, July 1957, p. 42-43.

Effect of temperature on tensile properties of high-purity nickel; tests made at temperatures from −320 to +1500° F. on annealed specimens of 99.85% pure nickel.
(Q27a, 2-11; Ni-a)

904-Q. Fatigue Limits and Size Effect Investigated With Special Reference to Reversed Direct Stress. A. Pasetti. *Fiat Stabilimento Grandi Motori, Technical Bulletin,* v. 9, no. 2, Apr-June 1956, p. 25-38.

Report on a series of tests at the Fiat laboratories. 10 ref. (Q7)

905-Q. Progress in the Development of High-Duty Malleable Cast Iron. Bertil Thyberg. *Foundry Trade Journal,* v. 103, Aug. 22, 1957, p. 213-224.

Production in the Husqvarna concern in Sweden is described, both on laboratory and production scales, together with the effects of carbon, silicon and metallic alloying elements. The application of special heat treatments enabled tensile-strength range to be increased to 24.1-26.6 tons per sq. in. 9 ref.
(Q27a, 2-10; CI-s)

906-Q. Internal Friction of Plastically Deformed Copper. A. S. Darlling. *Institute of Metals, Journal,* v. 85, Aug. 1957, p. 489-505.

Investigation of the effect of plastic deformation upon the internal friction of tough-pitch and high-purity copper by means of a torsion pendulum having a low background energy loss. The internal-friction effects induced by plastic deformation can be eliminated from tough-pitch copper, and reduced in high-purity copper, by annealing at 160° C.
(Q22, 3-18; Cu)

907-Q. Role of Atmospheric Oxidation in High Speed Sliding Phenomena. *Journal of Applied Physics,* v. 28, Aug. 1957, p. 835-843.

Influence of load, speed and sample geometry on the extent to which welding and consequent tearing of surfaces of hardened steel (S.A.E. 1095) are prevented in unlubricated high-speed sliding is studied through microscopic examination of surface damage. 26 ref. (Q9p; CN)

908-Q. Metal Transfer in Sliding Contacts. D. G. Flom. *Journal of Applied Physics,* v. 28, Aug. 1957, p. 850-854.

Study of transfer, in sliding contacts, of radioactive silver from silver-graphite riders to rotating cylinders of graphite and of copper. Silver transfer to a copper cylinder is roughly 20-fold greater than to a graphite cylinder. 8 ref.
(Q9p; Ag, Cu)

909-Q. Functional Testing of Cold Reduction Lubricants. J. F. Griffin. *Journal of Metals,* v. 9, Aug. 1957, p. 1042-1043.

Torque test measures film friction properties under a calcuated static million psi. load, simulating the pressure and relative speed between the work roll and the strip.
(Q9p, 1-4; NM-h)

910-Q. Fatigue Failure—A Structure Study. A. A. Krishnan and K. D. Maji. *Journal of Scientific and Industrial Research,* v. 16B, Mar. 1957, p. 105-116.

X-ray diffraction and metallographic techniques in study of crystalline changes in copper subjected

to alternate tension and compression in both safe and unsafe ranges. Results indicate factors responsible for intensification of slip lines, formation of slip striations at fractured stage and breakdown of grains may be responsible for formation of a fatigue crack. 19 ref. (Q7, M27; Cu)

911-Q. New Titanium Alloys. *Light Metal Age,* v. 15, Aug. 1957, p. 36-37. (CMA)

Rem-Cru's Ti-6.5Al-3.75Mo alloy, C-130AMo, has improved hot strength, good time-temperature-stress stability, deep hardenability and good heat treated properties. Data are presented for other mechanical properties such as ultimate tensile and yield strengths, percent elongation, reduction of area, shear strength, fatigue and impact. (Q general; Ti)

912-Q. Mechanical Properties of Iodide Titanium. *Metal Industry,* v. 91, Aug. 16, 1957, p. 134. (CMA)

Russian work on the strength and ductility of iodide titanium is cited. This work consisted of impact bend tests on notched specimens and strength and ductility tests in the range —196-1000° C. It is probable that the structure of titanium can be improved by heating to 1200° C. and hot working and annealing at 700° C. Graphs show the effect of annealing temperature vs. mechanical properties. 6 ref. (Q general, 2-14; Ti)

913-Q. Strain-Ageing as an Explanation of the Knee in the Fatigue Curve of Mild Steel. John C. Levy. *Metallurgia,* v. 56, Aug. 1957, p. 71-73.

Effect of strain-aging on fatigue life. An explanation is offered of the sharp "knee" and well-defined fatigue limit in the S-N curve of mild steel by postulating two such curves —one for the non-strain-aged material and another for the fully strain-aged material. Transformation from one to the other by strain-aging during the test can then produce the "knee" in the curve. 12 ref. (Q7, N7e; SN)

914-Q. Problems of Brittle Fracture. Pt. 4. W. D. Biggs. *Welder,* v. 26, Jan-Mar. 1957, p. 2-7.

General consideration of ductility transition as criterion for brittle fracture; design, material composition and welding practice in relation to probability of initiating and propagating brittle fracture. 10 ref. (Q26s, Q23r)

915-Q. Concept of Creep. E. N. da C. Andrade. Paper from "Creep and Recovery", American Society for Metals, p. 176-198.

Physical distinction between primary, β, and secondary, k, flow; behavior of cubic and hexagonal metals; useful characteristics of shear method; behavior of surface grains; significance of temperature relative to melting point. 33 ref. (Q3)

916-Q. Theory of Creep. Gunther Schoeck. Paper from "Creep and Recovery", American Society for Metals, p. 199-226.

Basic principles of phenomenological aspects of creep; geometrical aspects of plastic deformation; structural details of creep deformation likely to occur under different conditions and characteristic differences between various metals. 71 ref. (Q3, Q24, 10-1)

917-Q. Role of the Boundary in Creep Phenomena. Earl R. Parker and Jack Washburn. Paper from "Creep and Recovery", American Society for Metals, p. 227-250.

Basic mechanism; effects on creep of external surfaces, ordinary grain boundaries, dislocation boundaries, impurities and second phase particles. 34 ref. (Q3, M27f)

918-Q. Discussion of Parker and Washburn Paper on the Role of the Boundary in Creep Phenomena. Ray W. Guard. Paper from "Creep and Recovery", American Society for Metals, p. 251-254.

Metallographic observations of geometrical etch pit patterns observed on creep specimens of polycrystalline nickel which indicate three important aspects of polygonization during creep. 2 ref. (Q3, M27f)

919-Q. Spectrum of Activation Energies for Creep. John E. Dorn. Paper from "Creep and Recovery", American Society for Metals, p. 255-283.

Activation energies for high-temperature creep, for grain-boundary shearing and for self-diffusion. Structural changes in high-temperature creep; effect of stress on creep rate and theories of creep. 34 ref. (Q3, P13a, N1d)

920-Q. Creep and Fracture. Nicholas J. Grant and Arup R. Chaudhuri. Paper from "Creep and Recovery", American Society for Metals, p. 284-343.

Processes of deformation and structural changes during creep; types of fracture and effects of metallurgical variables and conditions of deformation on fracture. 91 ref. (Q3, Q27)

921-Q. Creep of Crystalline Nonmetals. J. B. Wachtman, Jr. Paper from "Creep and Recovery", American Society for Metals, p. 344-360.

Creep of single crystal and polycrystalline ceramic oxides. Available data indicate that creep occurs at much higher temperatures in oxide ceramics than in metals and with the same complexity of behavior. 24 ref. (Q3; 6-20)

922-Q. Effect of Differences in Ductility on Fracture Patterns. F. P. Rybalko. *Fizika Metallov i Metallovedenie,* v. 3, no. 1, 1956, p. 185-186. (*Henry Brutcher Translation* no. 3923.)

Changes in ductility (induced by tempering of quenched and polished 0.45% C, 0.9 Cr, 1.65 Ni, 0.25 Mo, 0.15 V steel cylinders) in relation to appearance of their (tensile) fracture surfaces; classification and description of fracture patterns; observation of ordered arrangement of protrusions on fracture faces; stress states from which the fracture patterns observed result. (Q26, Q23p)

923-Q. (French.) **Relation Between the Nature of Plastic Deformation in Aluminum and the Appearance of Laue Spots.** Michel Wintenberger. *Comptes Rendus,* v. 244, May 27, 1957, p. 2716-2718.

Direction of grooves in Laue spots corresponds to orientation of slip lines. Also, number of grooves per spot, about 10, corresponds to number of slip bands observed micrographically in region irradiated by X-rays. This striation is due to the fact that plastic deformation is produced only along slip planes. (Q24a; Al)

924-Q. (French.) **Contribution to the Study of the Influence of Slight Additions of Alloying Elements to a Chromium-Manganese-Silicon Steel.** F. Maratray and G. Delbart. Institut de Recherches de la Siderurgie, Publications, Ser. A, no. 151, Feb. 1957, p. 1-35. (Reprinted from *Revue de Metallurgie,* v. 53, Nov. 1956, p. 849-883.)

Attempt was made to improve Cr-Si-Mn base steel by adding molybdenum, vanadium, boron and other elements which normally accompany such additions, such as aluminum and titanium, and to determine results on hardenability, temper brittleness and mechanical properties in general. 8 ref. (Q general, J5, 2-10; AY)

925-Q. (French.) **Relation Between Permanent Deformation in a Simple Tensile Test and the Flow of Steels at Ordinary Temperature.** Kazimierz Gamski. *University of Liege, Centre d'Etudes de Recherches et d'Essais Scientifiques du Genie Civil, Bulletin,* v. 8, 1956, p. 171-291.

Experiments conducted over a period of several years provide basis for formula for estimating cold flow after, say, 1000 hr., and under given stress, on basis of instantaneous permanent deformation resulting from simple tensile test with same load. 89 ref. (Q27, Q24; ST)

926-Q. (German.) **Hardening Carbon Steel by Deformation.** Friedrich Erdmann-Jesnitzer and Gunther Häusster. *Neue Hutte,* v. 2, July 1957, p. 409-417.

Curves for Brinell and microhardness following cold forming; notched-bar impact test curves; influence of type of deformation (stretching, twisting); recrystallization retardation and recrystallization anomalies. 35 ref. (Q23a, Q29a; CN)

927-Q. (Japanese.) **Characteristics of Work Hardening and Anneal Softening of Titanium-Base Ti-Al Alloy Wires.** Y. Yagi. *Japan Institute of Metals, Journal,* v. 21, May 1957, p. 360-363. (CMA)

Microstructures and work hardening of titanium and Ti-Al alloys (1-4%) were investigated. Cold drawn specimens showed less twinning and work hardening for the alloys than for the metal. When annealing 56% reduced wire for 1 hr., the beginning temperatures of recrystallization were 500, 575, 600-650 and 650-700° C. for titanium, Ti-1Al, Ti–2Al and Ti-4Al, respectively. (Q24, J23, M27; Ti)

928-Q. (Japanese.) **Effect of Elastic Strain on Stress Distribution at the Neck of Tension Test Specimen.** Ishibashi. *Japan Society of Mechanical Engineers, Transactions,* v. 23, July 1957, p. 444-447.

Effect of elastic strain around the neck of test specimens was analyzed; relationship between radial and circumferential stress discussed. 5 ref. (Q27h)

929-Q. (Japanese.) **Effect of Repeated Bending Stress on the Hardness of Low-Carbon Steel.** Fenji Ando and Sadasi Nishio. *Japan Society of Mechanical Engineers, Transactions,* v. 23, July 1957, p. 495-499.

Micro-Vickers hardness tests at 50-g. and 1000-g. loads; microstructure and heat treatment effect on bending stress. 10 ref. (Q29a, Q5g; CN)

930-Q. (Japanese.) **6th Report. Some Effects in Shore Hardness Number on the Distance Between Impact Indentations. 7th Report. Effect of Inclination.** Shuro Macida. *Japan Society of Mechanical Engineer, Transactions,* v. 23, July 1957, p. 506-518.

The effect of the distance between impact indentations made by the diamond hammer of the Shore scleroscope. (Q29c)

931-Q. (Japanese.) **Relation Between Percent Elongation and Reduction of Area in Tension Tests.** Tatuzi Simigu and Masatosi Ide. *Japan Society of Mechanical Engineer, Transactions,* v. 23, July 1957, p. 518-522.

New equations expressing the relation betwen elongation and reduction of area, general concentration being considered in addition to minimum concentration. (Q27)

932-Q. (Russian.) **Brittleness of Welded Joints in Titanium Caused by Hydrogen.** S. M. Gurevich. *Metallovedenie i Obrabotka Mietallov,* No. 6, June 1957, p. 47-50. (CMA)

Examination of mechanical properties of welds in titanium containing 0.01-0.05% H showed that, while the impact strength is considerably lowered, the tensile strength (for hydrogen contents above 0.03%) is somewhat increased. The introduction of metals (like aluminum and tin) which stabilize the monophase structure of titanium does not remove the brittleness caused by hydrogen. However, the addition of elements (like molybdenum) which stabilize the beta-phase of titanium does prevent hydrogen brittleness of welds. 11 ref. (Q26s; Ti, *H*, 7-1)

933-Q. (Spanish.) **Mechanical Properties of Metals.** *Fusion de Metales,* v. 19, May-June, 1957, p. 17-20.

Tensile strength and means of testing; calculation of ultimate tensile strength. (To be continued.) (Q27, 1-4)

934-Q. (Spanish.) **Fatigue and Design Considerations in Welded Naval Construction.** Z. Garcia Martin. *Ciencia y Tecnica de la Soldadura,* v. 7, May-June 1957, 18 p.

General review of fatigue fracture, mechanical characteristics of metals subjected to static and dynamic loads, permissible stress and safety factor, nominal stress and notch effects in welded joints, distribution of stresses, design recommendations, importance of shape of structure, behavior of riveted and welded structures, fatigue strength of butt welds. 5 ref. (Q7a, T22g; 7-1, 17-1)

935-Q. (Book.) **Creep and Recovery.** 372 p. 1957. American Society for Metals, 7301 Euclid Ave., Cleveland 3, Ohio. $6.

Papers presented at Seminar held during National Metal Congress and Exposition, October 1956, cover various aspects of recovery; interaction of dislocations and vacancies and grain boundary behavior in creep of crystalline metals; and creep of crystalline nonmetals. Papers separately abstracted. (Q3, N4)

936-Q. (Book.) **Effect of Residual Elements on the Properties of Metals.** 217 p. 1957. American Society for Metals, 7301 Euclid Ave., Cleveland 3, Ohio. $4.

Five lectures presented during the National Metal Congress and Exposition, Cleveland, Oct. 8-12, 1956. Papers abstracted separately. (Q general, M general, P general, 2-10)

937-Q. (Book.) **American Society for Testing Materials, Proceedings, v. 56.** 1956. 1497 p. A.S.T.M., 1916 Race St., Philadelphia 3, Pa.

Technical papers, except for those previously covered, are abstracted separately. (Q general)

938-Q. **"Exotic" Metals Look Good for Tomorrow's High-Temperature Structures.** Irwin Stambler. *Aviation Age,* v. 28, Sept. 1957, p. 42-47. (CMA)

Columbium, vanadium and molybdenum as refractory structural metals. Molybdenum appears somewhat inferior as regards general mechanical properties, particularly creep, oxidation resistance. Vanadium metal is weak at 25° C., but the decrease in strength with rising tem-

perature is slow. The V-Ti series of alloy is the only one showing good tensile properties over a wide range of compositions. Data on the mechanical properties of zirconium, hafnium and zirconium alloys are tabulated.
(Q general, 2-12; SGA-h, Cb, V, Mo, Zr, Hf)

939-Q. Properties of Materials at Low Temperatures. Part 3. R. J. Corruccini. *Chemical Engineering Progress,* v. 53, Aug. 1957, p. 397-402.

Factors influencing transition temperature; correlation of ductile-brittle transition with lattice type of metal. (Q23r, 2-13)

940-Q. Brittle Fracture of Mild Steel in Torsion. J. B. Hunt. *Engineering,* v. 184, Aug. 9, 1957, p.173-174.

Impact tests have been made on mild steel speciments in torsion at low temperatures in order to study the variation in stress-strain characteristics as brittle fracture conditions are approached. It was found that a uniform elasto-plastic twist existed and that this twist became a maximum when the over-all ductility began to decrease. Torque-twist curves with a negative slope after yield were obtained.
(Q26s, Q1b; CN)

941-Q. Age "Custom" Properties Into 17-4 PH Castings. D. D. Durgan. *Iron Age,* v. 180, Aug. 29, 1957, p. 67-69.

Data on cast 17-4 PH stainless include mechanical properties after precipitation hardening at various temperatures between 800 and 1200° F. (Q general, 2-14, J27d; SS, 5-10)

942-Q. Bearing Characteristics of Nickel-Base Alloys. R. K. Kozlik. *Machine Design,* v. 29, Aug. 22, 1957, p. 139-142.

Mating of a variety of nickel-base alloys with dissimilar alloys containing hard phases, or soft phases with good lubricating qualities, effects substantial improvements in wear resistant characteristics.
(Q9n; Ri)

943-Q. Titanium Vs. Steel Alloys for High-Temperature Structures. D. D. Cox. *Machine Design,* v. 29, Sept. 19, 1957, p. 184, 186. (CMA)

Titanium alloys and steels are compared as applied to high-temperature structures. Above 600° F. Ti-16V-2.5Al has the advantage over 12 Cr steel, which has only a slight advantage over Ti-6Al-4V as to general efficiency. In many designs, however, the strength-weight ratios at 70° F. are much more important than those at 600° F. At 1000° F., both titanium alloys and steel lose efficiency rapidly.
(Q27a, 2-12; Ti, AY)

944-Q. Severe Abrasion? Try White or Chilled Cast Iron. *Materials in Design Engineering,* v. 46, Aug. 1957, p. 99-101.

Physical and mechanical properties including extremely hard surface and controllable core make alloyed white and chilled iron castings useful in applications requiring wear and abrasive resistance.
(Q9n; CI-p)

945-Q. New Nickel Alloys for High Temperature Service. Randolph P. Dominic. *Materials in Design Engineering,* v. 46, Sept. 1957, p. 115-119.

Data on five new modifications of Inconel and Incoloy—Inconel 700, 702, and 713C and Incoloy T and 901. Improvement in their high-temperature strength results from age hardening characteristics imparted by the addition of aluminum and titanium.
(Q general, 2-12; Ni, SGA-h)

946-Q. High Strength Aluminum Castings. John V. Houston, Jr. *Materials in Design Engineering,* v. 46, Sept. 1957, p. 124-125.

Analysis of properties of two high-strength grades of Type 356 aluminum alloy sand castings (Ductaluminum). (Q general; Al, 5-10)

947-Q. The Effect of Ceramic Coatings on Creep. *Metal Finishing Journal,* v. 3, Aug. 1957, p. 326, 338.

Note on effect of ceramic coatings on creep in nickel-chromium alloys.
(Q3m; Ni, Cr, 8-21)

948-Q. Scrap in Deep Drawing Reduced 90%. C. Kenneth Divers. *Metal Progress,* v. 72, Sept. 1957, p. 88-91.

Manufacture of wheel disks and hub caps of brass, stainless, and steel strip with minimum press room scrap has been correlated with preliminary tests on Olsen cup tester. Criteria are load to produce necking and corresponding height of cup.
(Q23q, 1-4, G4b; Cu-n, SS, CN)

949-Q. Two Promising New Titanium Alloys. S. Abkowitz and Dillon

Evers. *Metal Progress,* v. 72, Sept. 1957, p. 97-102. (CMA)

Ti-2.5Al-16V was developed in response to the need for a formable sheet alloy which could be aged to high strength. Tensile and yield strengths in the solution treated condition are 110,000 and 50,000 psi.; after age hardening the values are 170,000 and 160,000 psi., respectively. Ti-8Al-2Cb-1Ta was developed as a weldable sheet and bar alloy for high-temperature use. Unlike Ti-8Al, the alloy is thermally stable at high temperatures. Strength and notch sensitivity compare favorably with Ti-5Al-2.5Sn.
(Q23q, Q27a, Q3m, 2-12, 2-14; Ti)

950-Q. On the Causes of Large Plastic Deformations in the Stretching of Metal Samples With Annular Grooves. Yu. I. Likhachev. *Soviet Physics,* v. 1, no. 8, p. 1785-1790. (Translated by American Institute of Physics.)

Appearance of large plastic deformations long before fracture due to penetration of plastic deformation region to axis of sample on both sides of the smallest groove cross section with formation of a closed plastic region containing the elasto-deformed nucleus. 7 ref. (Q24)

951-Q. General Method of Analysis of Primary Creep Data (Including Analysis of Uranium Creep Data). K. R. Merckx. *U. S. Atomic Energy Commission,* HW-50363, May 1, 1957, 21 p.

The experimental results of creep tests run on alpha uranium are analyzed and formulated into a mathematical model for material behavior. 9 ref. (Q3; U)

952-Q. Improvement of the Impact Resistance of Cermets. A. C. Pezzi and H. P. Kling. Sylvania Electric Products, Inc. (Wright Air Development Center), *U. S. Office of Technical Services,* PB 131093, Apr. 1957, 33 p. $1.00.

Appreciable improvement in the impact resistance of cermets through application of a ductile metallic coating; application of 0.018 in. of electrodeposited nickel, bonded by a suitable vacuum heat treatment, raised the cermet's impact strength from 2.65 and 3.36 in-lb. at room temperature and 1800° F., respectively, to values of 21.48 and 18.96 in-lb. at the same temperatures.
(Q6n; SGA-h, 6-20)

953-Q. A Handbook on the Properties of Cold Worked Steels. E. J. Ebert, Case Institute of Technology. (Watertown Arsenal Laboratory), *U. S. Office of Technical Services,* PB 121662, June 1955, 113 p. $3.00.

Data gained from five years of research into the extent to which cold worked steels might replace the more strategic heat treated alloy steels; engineering information is presented in basic handbook format for the use of design and ordnance engineers. First section contains a tabular presentation of the important engineering properties. Chapters deal with mechanism of cold working, composition effects, residual stresses, directionality, benefits and limitations, and guidelines to selection and cost of the cold worked product.
(Q general, Q24, 1-17; ST)

954-Q. Factors Involved in Brittle Fracture. M. W. Lightner and R. W. Vanderbeck. *U. S. Steel Engineering Sciences,* v. 4, no. 27, 1957, p. 1-57.

Notch toughness tests, the meaning of notch toughness, and the factors involved in failure. 53 ref. (Q26s)

955-Q. Quality Control of Steels for Welded Penstocks. W. Stauffer and A. Keller. *Welding Journal,* v. 36, Aug. 1957, p. 359s, 365s, 372s.

Mechanical tests used by Escher-Wyss Co. to control quality of ordinary and high-tensile steel plates. (Q general, 1-4; ST, 7-1, SGB-a)

956-Q. Design—Its Influence on Residual Stress and Brittle Fracture. J. L. Thomas. *Welding Journal,* v. 36, Aug. 1957, p. 387s-392s.

Relationship of residual stress to brittle fracture related to experience with railroad car components; influence of design in alleviating difficulty. (Q25h, Q26s, 17-1)

957-Q. Electro-Slag Welding Process. *Welding Journal,* v. 36, Aug. 1957, p. 381s and 392s.

Summary of tensile, notched impact and fatigue values of welds in steel sections made by Russian electro-slag welding process.
(Q27a, Q6n, Q7a, K1e)

958-Q. (German.) **Behavior of High-Temperature Steels in Long-Time Creep Tests at Temperatures Between 500 to 700° C. Introduction.** Kurt Richard. *Archiv für das Eisenhüttenwesen,* v. 28, May-June 1957, p. 245-246.

Large-scale tests are being carried out in a combined effort of various German industries to determine the creep rate and sustained stresses of 44 materials at elevated temperatures. The ultimate objective is to obtain reliable data for 100,000-hr. tests. It is hoped that relations between short-time tests and long-time tests can be established.
(Q3n, 2-12, 1-4)

959-Q. (German.) **Behavior of High-Temperature Steels in Long-Time Creep Tests at Temperatures Between 500 and 700° C. Pt. 1.** Helmut Reiner. *Archiv für das Eisenhüttenwesen,* v. 28, May-June 1957, p. 247-252.

Testing equipment and procedures used; specimen preparation; estimate of errors. (Q3, 1-3, 1-4, 1-10)

960-Q. (German.) **Behavior of High-Temperature Steels in Long-Time Creep Tests at Temperatures Between 500 and 700° C. Pt. 2. Evaluation Procedures.** Gerhard Bandel and Henning Gravenhorst. *Archiv für das Eisenhüttenwesen,* v. 28, May-June 1957, p. 253-258.

Methods applied in plotting curves; comparison with known values; mathematical and graphical procedures. 27 ref. (Q3, 1-4)

961-Q. (German.) **Behavior of High-Temperature Steels in Long-Time Creep Tests at Temperatures Between 500 and 700° C. Pt. 3. Results of Tests on Ferritic Tube Steels.** Eduard Jahn. *Archiv für das Eisenhüttenwesen,* v. 28, May-June 1957, p. 259-267.

Composition of materials tested; results with smooth, notched and welded specimens (to 5000 hr.). 4 ref. (Q3, 1-4, 1-10; ST)

962-Q. (German.) **Behavior of High-Temperature Steels in Long-Time Creep Tests at Temperatures Between 500 and 700° C. Pt. 4. Results of Tests on Ferritic Alloy Steels.** Helmut Holdt. *Archiv für das Eisenhüttenwesen,* v. 28, May-June 1957, p. 269-285.

Influence of alloy components on creep; influence of heat.
(Q3, 2-12, 2-10; AY)

963-Q. (German.) **Behavior of High-Temperature Steels in Long-Time Creep Tests at Temperatures Between 500 and 700° C. Pt. 5. Results of Tests on Austenitic Steels and Alloys.** Karl Bungardt. *Archiv für das Eisenhüttenwesen,* v. 28, May-June 1957, p. 287-304.

Influence of alloy components, notches, welding, cold forming and hot forming. 5 ref.
(Q3, 2-12, 2-10; AY)

964-Q. (German.) **Behavior of High-Temperature Steels in Long-Time Creep Tests at Temperatures Between 500 and 700° C. Pt. 7. Fatigue Tests on Ferritic and Austenitic Steels at Temperatures Between 500 and 650° C.** Max Hempel. *Archiv für das Eisenhüttenwesen,* v. 28, May-June 1957, p. 311-316.

Results of creep tests compared to fatigue tests on both smooth and notched specimens. Analysis of notch effect. 34 ref.
(Q3, Q7, 2-12; AY, SGA-h)

965-Q. (German.) **Behavior of High Temperature Steels in Long-Time Creep Tests at Temperatures Between 500 and 700° C. Pt. 8. Preliminary Conclusions.** Rudolf Schinn and Wilhelm Ruttman. *Archiv für das Eisenhüttenwesen,* v. 28, May-June 1957, p. 317-325.

Each material tested has individual long-time creep properties at elevated temperatures which cannot be predicted from any known short-time tests. However, it appears that the 20,000-hr. values permit fairly reliable interpolation. 5 ref.
(Q3m, 2-12; ST)

966-Q. (German.) **100,000-Hr. Creep Tests at 500° C. on Steels of Various Composition.** August Thum and Kurt Richard. *Archiv für das Eisenhüttenwesen,* v. 28, May-June 1957, p. 325-337.

Long-time creep tests were carried out on 50 steels at test times up to 140,000 hr. In some instances better results were obtained from notched specimens than from smooth ones. Other steels, however, showed increasing embrittlement thus resulting in high notch sensitivity under elevated temperatures and after longtime testing. No relationship between short-time and long-time tests is apparent. 28 ref.
(Q3, 1-4; AY)

967-Q. (German.) **Interpolation of Elevated Temperatures. Long-Time Creep Curves.** Alfred Krisch and Wolfgang Wepner. *Archiv für das Eisenhüttenwesen,* v. 28, May-June 1956, p. 339-344.

The creep curves obtained experimentally from 19 ferritic and 19 austenitic steels for at least two temperatures were tested against

mathematical results obtained from the Larson-Miller procedure. The correlation was unsatisfactory and no master curves could be established. There was ±10% accuracy of estimates for 10,000 hr. obtained from creep curves of 100 hr. and 1000 hr. at a 50° C. higher temperature. However, errors up to 40% occurred in some materials. 28 ref. (Q3, 1-4)

968-Q. (German.) **Influence of Crystal Orientation on the Fatigue Strength of Single Alpha-Iron Crystals.** Max Hemple, Albert Kochendörfer, and Emil Hillnhagen. *Archiv für das Eisenhüttenwesen,* v. 28, July 1957, p. 417-422.

Specimens were electrolytically polished to avoid surface stresses. The results were plotted in a stress-cycle diagram showing that single crystals of iron are independent of the crystal orientation, while polycrystal iron is strongly influenced by it. Crystal boundaries vertical to the direction of stress tend to lower the cycles sustained. 19 ref. (Q7a, 3-22; Fe, 14-11)

969-Q. (Italian.) **Results of Mechanical Tests on Samples of Spheroidal Cast Iron.** Edmondo di Giacomo. *Calore,* v. 28, May 1957, p. 187-195.

Samples from eight Italian foundries were tested at ordinary and high temperatures.
(Q general, 2-12; CI-r)

970-Q. (Italian.) **A Mathematical Theory of Deformation of Sheet Subjected to Plastic Bending.** Guido Danese. *Ingegneria Meccanica,* v. 6, Apr. 1957, p. 33-42.

Fundamental concepts of behavior under plastic bending of sheets of nonwork hardening material having much greater length than thickness; presentation of theory, based on differential calculus, which permits direct expression of laws of variation of thickness in relation to degree of bending; illustration of two general methods, based on this theory, designed to solve, graphically or analytically, problem of determination of ratio of final to initial thickness in terms of ratio of radius of internal curvature to initial thickness, or of the inverse parameter. (Q24, Q5; 4-3)

971-Q. (Japanese.) **Strength of Welded Products.** Otani. *Metals,* v. 27, Aug. 1957, p. 608-613.

Static fatigue and tensile strength of welded structures; effect of defects on the structure. (Q27a, Q7a; 7-1)

972-Q. (Japanese.) **Effect of Alloy Additions on Creep Strength of Copper.** Koda. *Metals,* v. 27, Aug. 1957, p. 641-644.

Effect of oxygen, phosphorus, silver, manganese, cadmium, chromium, zirconium and titanium in copper on creep strength and elongation. 11 ref. (Q3m, 2-10; Cu)

973-Q. (Japanese.) **Hot Working of Cast Iron.** *Metals,* v. 27, Aug. 1957, p. 659-662.

Mechanical properties of malleable cast iron, white heat cast iron and gray cast iron after hot working; the effect of alloying elements on cast irons; application of hot worked cast irons.
(Q general, 3-18, 2-10; CI)

974-Q. **Hot-Hardness Survey of the Zirconium-Uranium System.** W. Chubb, G. T. Muehlenkamp and A. D. Schwope. *American Society for Metals, Transactions,* v. 50, Preprint no. 2, 1957, 10 p.

A complete hardness survey of the zirconium-uranium system has been made at temperatures from room temperature to 900° C. The composition of maximum hardness increases from 40 at. % zirconium at room temperature to 60 at. % zirconium at 600° C. At 700° C., the hardness data indicated the presence of the beta uranium phase in alloys containing 95 and 100 at. % uranium. 6 ref.
(Q29p, M24b; Zr, U)

975-Q. **Temperature Stresses in the Two-Phase Alloy, WC-Co.** J. Gurland. *American Society for Metals, Transactions,* v. 50, Preprint no. 3, 1957, 16 p.

Thermally induced stresses in the WC constituent of sintered WC-Co alloys were calculated from elastic theory and were measured by X-ray diffraction techniques. The compositions of the alloys ranged from 5 to 37 vol. % cobalt. It was found that compressive stresses act on the dispersed carbide phase of high binder compositions but that tensile stress components become predominant in low binder alloys.
(Q25p; W, Co, 6-19)

976-Q. **Deformation and Fracture of Alpha Solid Solutions of Lithium in Magnesium.** F. E. Hauser, P. R. Landon and J. E. Dorn. *American*

Society for Metals, Transactions, v. 50, Preprint no. 5, 1957, 28 p.

Whereas coarse polycrystalline aggregates of magnesium are brittle at 78° K., alpha solid solutions of lithium in magnesium are ductile. The improved ductility of the lithium alloys of magnesium is associated with the introduction of prismatic (1010) <2110> slip in addition to basal (0001) <2110> slip. 12 ref. (Q24, M26b; Mg, Li)

977-Q. Some Aspects of Preyield Phenomena in Mild Steel at Low Temperatures. W. S. Owen, M. Cohen and B. L. Averbach. *American Society for Metals, Transactions,* v. 50, Preprint no. 9, 1957, 37 p.

The sequence of events leading to gross yielding at −196° C. has been explored by metallographic techniques, by the observation of strain patterns on long thin prepolished specimens, and by precise strain measurements as a function of stress and time. 23 ref. (Q25n, 2-13; CN)

978-Q. Strain Hardening of Austenitic Stainless Steel. G. W. Powell, E. R. Marshall and W. A. Backofen. *American Society for Metals, Transactions,* v. 50, Preprint no. 10, 1957, 40 p.

The strain-hardening characteristics of types 301 and 304 austenitic stainless steel have been studied as functions of temperature (20 to −263° C.), strain rate (100-fold variation), and stress system (tension, torsion, and compression) and correlated with quantitative measurements of the progress of the martensitic transformation. 34 ref. (Q24, M, LN8; SSe)

979-Q. Brittle-to-Ductile Transition Temperatures of Binary Chromium Base Alloys. E. P. Abrahamson, II, and N. J. Grant. *American Society for Metals, Transactions,* v. 50, Preprint no. 14, 1957, 17 p.

A correlation between the rate of transition temperature change and the electron configuration of the solute element is shown and a tentative explanation of transition temperatures is put forward. 13 ref. (Q23r; Cr)

980-Q. Mechanical Properties and Heat Treatment of Titanium-Columbium Alloys. L. W. Berger, D. N. Williams and R. I. Jaffee. *American Society for Metals, Transactions,* v. 50, Preprint no. 15, 1957, 21 p.

Mechanical properties of titanium-columbium alloys may be varied considerably by solution treatment in the alpha-beta field to control amount and composition of the retained beta, and alloys containing 20 to 35% columbium may be appreciably hardened by quenching from the beta field followed by aging. 12 ref. (Q general, J27a, J27d, Ti, Cb)

981-Q. Effect of Per Cent Tempered Martensite on Endurance Limit. F. Borik, R. D. Chapman and W. E. Jominy. *American Society for Metals, Transactions,* v. 50, Preprint no. 16, 1957, 24 p.

The endurance limit drops with the presence of small percentages of nonmartensitic products. As the per cent of martensite decreases below 85%, the endurance limit is not as sensitive to microstructure. 7 ref. (Q7a, N8p, 3-21; CN, AY)

982-Q. Effect of Microstructure and Heat Treatment on the Mechanical Properties of AISI Type-431 Stainless Steel. G. E. Dieter. *American Society for Metals, Transactions,* v. 50, Preprint no. 18, 1957, 26 p.

Transverse tensile tests on commercial forgings of AISI Type-431 stainless steel have shown that the transverse ductility is considerably improved when the steel does not contain delta-ferrite stringers. Ordinary Type-431 steel with ferrite stringers does not possess adequate transverse ductility when heat treated to a tensile strength of 200,000 psi. Examination of the deformation process showed that the low ductility is the result of localized cracking in the ferrite stringers. 7 ref. (Q27a, 2-14, 3-21; S5)

983-Q. Effects of Temperature-Time Histories on the Tensile Properties of Airframe Structural Aluminum Alloys. R. E. Fortney and C. H. Avery. *American Society for Metals, Transactions,* v. 50, Preprint no. 23, 1957, 16 p.

To obtain generalizations tensile tests were performed at room temperature, 200, 300 and 400° F. after single and sequential exposures sampling the temperature ranges of 300-600° F. (2024-T3) and 250-500° F. (7075-T6) and the time range of 0.1-1000 hr. Statistical calculations were made to determine the degree of conformance of test data and generalized equations. The conclusion was reached that the yield and ultimate strength generalized equations

are adequate for analyzing the effects of those service time-temperature exposure histories within the range room temperature to 500° F. and 1.0 to 1000 hr. on the room temperature to 400° F. tensile strengths of subject airframe alloys.
(Q27a, 2-11; Al, SGB5)

984-Q. Mechanical Properties Correlated With Transformation Characteristics of Titanium-Vanadium Alloys. E. L. Harmon, J. Kozol and A. R. Troiano. *American Society for Metals, Transactions,* v. 50, Preprint no. 26, 1957, 35 p.

Microstructural changes in the alloys resulting from variation of alloy content and heat treatment exerted a profound influence on strength and ductility. Increasing vanadium concentration in alloys consisting entirely of alpha prime resulted in higher strength and notch sensitivity, and lower ductility and impact resistance. Alloys containing substantial quantities of omega in the quenched structures exhibited high strength and low ductility. A quenched 11% vanadium alloy was very ductile and possessed an exceptionally low ration of yield strength to tensile strength.
(Q27a, Q23p, N7c; Ti, V)

985-Q. Initiation of Brittle Fracture in Mild Steel. J. A. Hendrickson, D. S. Wood and D. S. Clark. *American Society for Metals, Transactions,* v. 50, Preprint no. 28, 1957, 22 p.

Notched tensile specimens have been tested at temperatures of −30, −79 and −129° C. at rates of application of nominal stress ranging from 10^2 to 10^7 lb/in.^{2} sec. The magnitude of the maximum nominal stress (fracture stress) has been determined for those tests in which brittle fracture occurred. The distribution of stress on the cross-section at the root of the notch at the instant of brittle fracture has been determined analytically. The effect of local plastic deformation at the root of the notch has been taken into account by employing an elastic-plastic stress analysis. 15 ref.
(Q26s; CN)

986-Q. Distribution of Residual Stresses in Carburized Cases and Their Origin. D. P. Koistinen. *American Society for Metals, Transactions,* v. 50, Preprint no. 31, 1957, 24 p.

The residual stress distributions through the carburized cases were correlated with the crystalline phase compositions as determined by X-ray diffraction studies and with the carbon distribution. It is shown that the experimental data support the theory that the origin of the compressive stress in the case lies in the sequence in which transformations occur in the case and in the core. 11 ref.
(Q25h, N8, J28; CN, AY)

987-Q. Carbide Precipitation and Brittleness in Austenitic Stainless Steel. A. Kramer and W. M. Baldwin, Jr. *American Society for Metals, Transactions,* v. 50, Preprint no. 32, 1957, 18 p.

The tensile ductility of three 18-8 austenitic stainless steels — AISI Types 304 ELC (extra low carbon, 0.024% C.), and 302 (0.09% C.) in both the annealed and the sensitized condition (carbide-precipitated condition) was determined as a function of testing temperature (−321 to +500° F.) and strain rate (0.05 to 19,000 in./in./min.). 18 ref.
(Q23p, N8; SSe)

988-Q. Microstructural Changes of Uranium Upon Thermal Cycling. L. T. Lloyd and R. M. Mayfield. *American Society for Metals, Transactions,* v. 50, Preprint no. 35, 1957, 29 p.

Microstructural observations of the deformations that occur in uranium during thermal cycling show that the macro growth embodies phenomena similar to those that occur in creep. Coarse-grained specimens deform by slip, twinning, and localized interactions at the grain boundaries. 18 ref. (Q24, 1-11, Ns; U)

989-Q. Study of the Role of Carbon in Temper Embrittlement. E. B. Mikus and C. A. Siebert. *American Society for Metals, Transactions,* v. 50, Preprint no. 39, 1957, 19 p.

Electron microscopy and autoradiography using carbon-14 were used to study the distribution of carbon in tough and temper-embrittled structures of a 3140 steel. Isothermal heat treatments up to 500 hr. were investigated. In light of these studies a number of theories on the mechanism of temper embrittlement were evaluated and a new mechanism was proposed based on the development of strained prior austenite boundaries during the embrittling heat treatment. 18 ref.
(Q26S, 2-14; AY)

990-Q. Some Properties of Uranium-Low Titanium Alloys. Daniel J. Murphy. *American Society for Metals, Transactions,* v. 50, Preprint no. 40, 1957, 25 p.

Titanium additions over the range 0.1 to 1.5% have been investigated for improvement in mechanical properties and corrosion resistance over those of unalloyed uranium. The effects on microstructure of various heat treatments and cooling rates have been correlated with mechanical properties.
(Q general, R general, 2-14; U, Ti)

991-Q. Brittle Fracture of Mild Steel in Tension at −196° C. W. S. Owen, B. L. Averbach and M. Cohen. *American Society for Metals, Transactions,* v. 50, Preprint no. 41, 1957, 22 p.

With the aid of long thin strip specimens loaded at controlled cross-head speeds between 8.9 x 10^{-4} and 1.6 x 10^{-1} in./min., the strain pattern and microscopic changes preceding fracture were observed, and the local strain situation was measured. Specimens heat treated to alter the tendency toward brittle behavior, but maintaining ferrite-pearlite structures, were also examined. 22 ref. (Q26s, 1-13; CN)

992-Q. Machinability of Type-A Leaded Steels. E. J. Paliwoda. *American Society for Metals, Transactions,* v. 50, Preprint no. 42, 1957, 19 p.

The machining uniformity of Type-A leaded steels appears to be subject to the same chemical composition variables which affect the machinability of nonleaded and open-hearth free cutting steel. As in the case of C-1213 steels, oval sulphide inclusions are favorable to the machinability of Type-A steels with stringer-like sulphides being less effective. Lead inclusions mass appears to be dependent on sulphide inclusion nature with fine lead tails being associated with fine stringer-like sulphides. 13 ref.
(G17k, 1-10; CN, Pb)

993-Q. Tensile and Stress-Rupture Properties of Chromium. J. W. Pugh. *American Society for Metals, Transactions,* v. 50, Preprint no. 44, 1957, 12 p.

The temperature dependance of the tensile and stress-rupture properties of chromium were evaluated up to 2200° F. The chromium metal used was arc-melted, extruded, and swaged, but was not of special purity. Its ductile-brittle transition temperature for the testing procedure used was about 600° F. No yield points were observed, but some evidence of strain-aging at intermediate temperatures was obtained. 11 ref. (Q27a, Q3m; Cr)

994-Q. Evaluation of a New Titanium-Base Sheet Alloy, Ti-4Al-3Mo-V. R. S. Richards, D. L. Day and H. D. Kessler. *American Society for Metals, Transactions,* v. 50, Preprint no. 45, 1957, 33 p.

Sheet from a production-size ingot of a new titanium-base alloy, Ti-4Al-3Mo-1V, was evaluated on the basis of annealed, solution treated, and solution treated-and-aged properties. Stress-stability tests, cold rolling, welding, and actual forming of parts in the solution treated condition were also performed.
(Q general, J27a; Ti, 4-3)

995-Q. Some Relationships Between Torsional Strength and Electron Microstructure in a High Carbon Steel. S. T. Ross, R. P. Sernka and W. E. Jominy. *American Society for Metals, Transactions,* v. 50, Preprint no. 46, 1957, 28 p.

Austempered and quenched and tempered SAE 51100 steel samples were tested to failure in torsion. All oil quenched samples were tempered in the 400-550° F. range. Austempering was also done in this range. The torsional yield strength-hardness relationship was plotted for both austempered and quenched and tempered samples. Representative samples of each heat treatment were examined with the electron microscope. 14 ref. (Q1a, 2-14, M21e; AY)

996-Q. Mechanical Properties of Forged Chromium. S. A. Spachner and W. Rostoker. *American Society for Metals, Transactions,* v. 50, Preprint no. 48, 1957, 20 p.

Procedures for melting, forging and machining chromium. The torsional mechanical properties of an electrolytic grade of chromium in the forged state have been studied in the testing range RT-1000° C. and 0.01-1 in./in./min.. The transition temperature of chromium has been related to the amount and temperature of prestrain. Indications are cited that refinement of the recrystallized grain size can depress the transition temperature. 5 ref.
(Q23r, Q1a; Cr, 4-1)

997-Q. Energy Stored in Ingot Iron Deformed by Torsion at 25, −82 and

−185° C. T. P. Wang and Norman Brown. *American Society for Metals, Transactions*, v. 50, Preprint no. 53, 1957, 30 p.

Stored energy of Armco ingot iron previously deformed at 25, −82 and −185° C. by torsion were measured during its release upon annealing. Energy from 0.3 to 1.1 cal./gm. was found to release in two stages. The first stage of energy release is attributed to recovery. The release of the major portion of the stored energy is concurrent with recrystallization. 23 ref.
(Q24, Q1, N5; Te-a)

998-Q. An Aluminum Alloy of 1912. *Light Metals*, v. 20, Sept. 1957, p. 300-301.

Results of tensile, compression, hardness and impact tests made on Ormiston metal; suggested uses for this alloy developed in 1912.
(Q general, 17-7; Al)

999-Q. Rate of Strain Nomograph. William H. Mather. *Metal Progress*, v. 72, Sept. 1957, p. 96-96-B.

Nomograph showing strain rate when Young's modulus and load are known. (Q25n, 1-4, 3-17)

1000-Q. Effect of Surface Treatment on the Mechanical Properties of Tungsten. K. Sedlatschek and D. A. Thomas. *Powder Metallurgy Bulletin*, v. 8, June 1957, p. 35-40.

Investigation of effects of electrical polishing on transverse rupture strength, deflection, tensile strength and elongation of surface treated tungsten rods. (Q general, L10b; W)

1001-Q. Arrest of Brittle Fractures in Wide Steel Plates. R. J. Mosborg, W. J. Hall and W. H. Munse. *Welding Journal*, v. 36, Sept. 1957, p. 393s-400s.

Tests were conducted at various combinations of temperature and stress and were concerned with the behavior of welded crack arresters composed of a strake of tough material butt welded to form an integral part of the structure. Under certain conditions such strakes will arrest a propagating brittle crack.
(Q26q; ST, 4-3)

1002-Q. Effect of Metallurgical Variables on Transition Behavior in Charpy Slow-Bend and Impact Tests. C. E. Hartblower. *Welding Journal*, v. 36, Sept. 1957, p. 401s-409s.

Variables selected for study were three subcritical heat treatments involving the phenomenon of quench aging and variations in composition by the controlled addition of carbon and manganese as alloying elements. 8 ref. (Q23r, Q6, 2-10; ST)

1003-Q. Mechanism of Flake Formation in Steel. V. S. Mes'kin. *Stal'*, v. 16, no. 8, 1956, p. 727-734. (*Henry Brutcher Translation* no. 4010.)

Previously abstracted from original. See item 899-Q, 1956.
(Q23, Q26, ST)

1004-Q. Chemical Analysis of the Surface Layers of Metal Exposed to Different Types of Wear. B. I. Kostetskii, N. L. Golego and P. K. Topekha. *Vestnik Mashinostroeniya*, v. 36, no. 10, 1956, p. 25-26. (*Henry Brutcher Translation* no. 4037.)

Special method developed for taking samples of thin surface layers exposed to frictional wear, for simple and accurate chemical analysis; details on wear-testing and sampling arrangement; types of wear obtained at different sliding speeds and under different pressures and the corresponding oxygen (and nitrogen) contents of surface layer.
(Q9, S12h, S11)

1005-Q. Effect of Baking Upon Mechanical Properties of Chromium-Plated Steel Parts. V. S. Borisov and F. N. Naumov. *Metallovedenie i Obrabotka Metallov*, no. 12, Dec. 1956, p. 50-56. (*Henry Brutcher Translation* no. 4040.)

Experimental study of the drop in the fatigue strength of steel during chromium plating. Data on effect of thickness of chromium deposit and of tempering (baking) temperature upon tensile strength, elongation and rotating-beam fatigue limit (10-million cycles) of a carbon and a low-alloy steel. Stress state of chromium deposit as function of tempering temperature.
(Q27a, Q7a, L17; ST, *Cr*)

1006-Q. (Czech.) **Influence of Deformation Occurring at Room Temperature on the Creep Behavior of Mild Carbon Steel.** Roman Sejnoha. *Hutnicke Listy*, v. 12, no. 2, 1957, p. 102-109.

Results of creep tests performed on mild carbon steel without preliminary deformation and with 11% preliminary deformation. 13 ref.
(Q3m; CN)

1007-Q. Ceramic Coatings vs. Creep Rates. *Ceramics*, v. 9, Sept. 1957, p. 21-22.

Study of creep behavior under different temperature-stress conditions of some alloys (including two 80-20 Ni-Cr alloys) coated with refractory-type ceramic materials indicated that under some conditions coating can reduce creep rate as much as 50% while under others a deleterious effect is observed. (Q3n; 8-21)

1008-Q. Steel for Canadian Pipelines. M. A. Scheil, G. E. Fratcher, S. L. Henry and E. H. Uecker. *Mechanical Engineering,* v. 79, Sept. 1957, p. 853-857.

Reports on hydrostatic burst tests at subzero temperatures made on commercial semikilled steel pipe of various diameters and wall thicknesses. Data on pipe performance and hydrostatic burst including strength, circumferential stretch, fracture type and shattering tendencies.
(Q10b, 2-13, T26r, 17-7; ST)

1009-Q. The Future of High-Temperature Metallurgy. L. P. Jahnke. *Metal Progress,* v. 72, Oct. 1957, p. 113-118.

Future advances must be conceivable, feasible and desirable. On this basis the author considers the effect of purity (both chemical and structural), especially of alloys based on columbium, molybdenum or tungsten, and predicts that by A.D. 2000 we will have alloys of useful strength up to 5500° F.
(Q27a, 2-12; SGA-h)

1010-Q. Some Properties of Nickel-Base Casting Alloys for High-Temperature Service. D. R. Wood and J. F. Gregg. *Metal Treatment and Drop Forging,* v. 24, Aug. 1957, p. 317-324.

Tensile impact, hardness and stress-rupture properties at room temperature and rupture properties at high temperatures of six nickel-base chromium-containing castings made in sand or investment molds. Casting characteristics and factors affecting casting qualities. (Q general, 2-12; Ni, SGA-h, 5-10, 5-12)

1011-Q. Experimental Study of the Mechanism of Plastic Deformation in Metal Cutting Compared With the Methods of Classical Stressing. Paul Bastien and Michel Weisz. *Microtecnic,* v. 11, No. 3, 1957, p. 122-129.

Following tests were conducted parallel to classical measurement of stress and deformation during cutting: static traction at ambient and various other temperatures; rapid traction at ambient and different temperatures; torsional stressing at ambient temperature; dynamic torsion stressing with and without initial hardening, with or without axial compression. (Q24, L17)

1012-Q. Effect of Metal Characteristics on Forming and Welding. Pt. 1: Forming. Lester F. Spencer. *MPM,* v. 14, Oct. 1957, p. 35-37, 64.

How to specify carbon steel sheet and strip on basis of factory designations and end use; limitations of carbon steel products for fabricating operations. (To be continued.)
(Q23q; CN, 4-3)

1013-Q. The Effects of Low Temperatures and Notch Depth on the Mechanical Behavior of an Annealed Commercially Pure Titanium. G. W. Geil and N. N. L. Carwile. *National Bureau of Standards, Journal of Research,* v. 59, Sept. 1957, p. 215-226. (CMA)

Annealed specimens of titanium in the notched and unnotched condition were strained to fracture at −196, −78, 25 and 100° C. The ductile-to-brittle transition occurs between 125—80° C.; the notch toughness retained at −196° C. is small. Lowering the temperature does not greatly affect the ability of titanium to deform under uniaxial stress, but greatly affects the ductility of titanium under multiaxial stress. The ductility of notched specimens decreased rapidly at all temperatures when the notch depth was 10%.
(Q23p, 2-13; Ti)

1014-Q. The Flow Stress of Polycrystalline Aluminum. C. J. Ball. *Philosophical Magazine,* v. 2, 8th Series, Aug. 1957, p. 1011-1017.

There is a strong correlation between flow stress and sub-grain size in polycrystalline Al deformed in tension; strength of boundaries does not appear to depend on boundary angle. Variation of flow stress with temperatures suggests that strength-controlling factor is elastic interaction. 9 ref. (Q27a, 2-9; Al)

1015-Q. Creep Testing of Platinum Alloys. F. C. Child. *Platinum Metals Review,* v. 1, Oct. 1957, p. 121-126.

An account of the Johnson-Matthey creep-testing laboratory for determining life-to-rupture under constant stress at temperatures from 400 to 900° C., using miniature creep-testing machines. Experimental results. 9 ref. (Q3, 1-3; Pt)

1016-Q. Formability of Flat Spring Material. John B. Beckwith. *Product Engineering,* v. 28, Sept. 16, 1957, p. 125-127.

Data on formability, tensile strength and hardness of spring steel strip containing 0.70 to 0.80 or 0.90 to 1.05% carbon.
(Q23q; CN, SGA-b, 4-3)

1017-Q. The Production of Line Networks on Sheet Metal for the Investigation of Its Behavior During Deformation. J. H. Zaat. *Sheet Metal Industries,* v. 34, Oct. 1957, p. 737-740.

Methods by which a network of lines may be applied to the surface of sheet metal. An essentially photographic method was selected which confers such properties as high adherence, ability accurately to follow deformation, absence of notch effect and simple application. 6 ref.
(Q24, 1-4; 4-3)

1018-Q. New Lower Alloy High Speed Steels. Howard E. Boyer. *Steel Processing and Conversion,* v. 43, Sept. 1957, p. 504-505; 530.

Economic advantages in reduced steel cost, machining and heat treating. Bend test and torsion impact test results of MV-1 low-alloy steel.
(Q5g, Q1b; TS-m)

1019-Q. Tool Steels. L. F. Spencer. *Steel Processing and Conversion,* v. 43, Sept. 1957, p. 511-516; 526-527.

Chemical composition of representative steels; suggested steels for specific applications; hardness after tempering and effect of multiple tempering on hardness of high speed steels. Brief description of high speed grades. (Q29n, T6n, 17-7; TS)

1020-Q. Fixture for Compression Testing of Sheet Materials at Elevated Temperatures. B. L. Molander, C. R. Waldron and J. C. Newland. *ASTM Bulletin,* no. 225, Oct. 1957, p. 37-39.

A device that reduces the high-temperature factors to a minimum and yet inhibits buckling; utilizes leaf-spring guides which move easily with compressive deformation of the test specimen but offer high resistance to lateral deflection. 8 ref.
(Q28, 1-3, 2-12; 4-3)

1021-Q. Review of Sonic Methods for the Determination of Mechanical Properties of Solid Materials. Clyde E. Kesler and Tien S. Chang. *ASTM Bulletin,* no. 225, Oct. 1957, p. 40-46.

The mechanical properties most often determined by sonic testing are the modulus of elasticity in compression, tension and shear, from which Poisson's ratio can be computed. In some methods, a measure of the viscosity of the material may be determined and expressed as damping capacity or as logarithmic decrement. 37 ref.
(Q21, P10f, Q8g, 1-24)

1022-Q. Porosity in Formed Titanium. R. A. Wood, D. N. Williams, H. R. Ogden and R. I. Jaffee. *Battelle Memorial Institute,* TML Report No. 72, May 17, 1957, 36 p.

A new type of material failure has been found in parts formed of commercial-purity titanium. Surface pitting and internal voids are formed in areas of the part which have been highly strained. The phenomenon has been named strain-induced porosity. 6 ref.
(Q23q; Ti, 9-18)

1023-Q. Fatigue Characteristics of a Riveted 24S-T Aluminum Alloy Wing. Pt. 3. Test Results. J. L. Kepert, C. A. Patching, M. R. Rice and J. G. Robertson. *Commonwealth of Australia, Aeronautical Research Laboratories,* Report ARVSM.248, Oct. 1957, 43 p., 24 full-page figures.

Fatigue tests were conducted on 178 specimens from 90 P-51D Mustang wings. Tabulation of fatigue life, type of failure and load range for each specimen. Crack propagation rate, local strain distribution, types of fatigue failure, effect of preload and variation in structural flexibility. 14 ref. (Q7; Al, 7-3)

1024-Q. Tensile Tests on Titanium. Control of Strain Rate. R. J. Parker. *Engineering,* v. 184, Sept. 27, 1957, p. 392-396. (CMA)

Commercial titanium and a Ti-Al-Mn alloy by ICI were subjected to tensile testing at strain rates up to 1 in. per in. per hr. The testing program conformed to a theoretical relationship between strain rate and speed of tensile testing, the derivation of which is included. 12 ref.
(Q27, 3-17; Ti)

1025-Q. Plastic Deformation of Aged Aluminum Alloys. G. Thomas and J. Nutting. *Institute of Metals, Journal,* v. 86, Sept. 1957, p. 7-14.

The electron microscope was used to study the metallography of the slip characteristics of aged and plastically deformed aluminum alloys containing 4% Cu and 7% Mg respectively. Microstructural changes during aging are shown. 15 ref. (Q24a, N7a, M21e; Al)

1026-Q. Structural Changes Caused by Plastic Strain and by Fatigue in Aluminium-Zinc-Magnesium-Copper Alloys Corresponding to D.T.D. 683. T. Broom, J. A. Mazza and V. N. Whittaker. *Institute of Metals, Journal,* v. 86, Sept. 1957, p. 17-23.

High-purity aluminum alloys containing 6% Zn, 3% Mg and 1% Cu have been used for metallographic investigations of tensile and fatigue phenomena. In alloys treated to an ultimate strength of about 40 tons per sq. in. with about 10% elongation, catastrophic softening on certain planes can be observed in the late stages of both tensile and fatigue tests. 19 ref.
(Q27a, Q7a, 3-18; Al, *Zn, Mg, Cu*)

1027-Q. Young's Modulus of Some Quenched and Aged Binary Aluminium Alloys. B. J. Elliott and H. J. Axon. *Institute of Metals, Journal,* v. 86, Sept. 1957, p. 24-28.

Variation of Young's modulus with composition for a series of binary aluminum-rich solid solutions containing Si, Cu, Ag, Au and Mg in the as-quenched and also in the aged condition. Some results are also reported for duplex aluminum alloys. 9 ref. (Q21a, 2-10, 2-14; Al)

1028-Q. Low-Temperature Impact Properties of Cast Steel. W. J. Jackson and G. M. Michie. *Iron and Steel Institute, Journal,* v. 187, Oct. 1957, p. 104-120.

Charpy V-notch and keyhole tests were carried out over a range of temperatures on steels in various conditions of heat treatment, and the V-notch impact transition curves were drawn. Hardness tests were also made at subzero temperatures. 12 ref. (Q6n, Q29n, 2-13; ST, 5)

1029-Q. Titanium and Its Alloys. *Materials in Design Engineering,* v. 46, Sept. 1957, p. 106-107. (CMA)

Physical, mechanical, fabricating and corrosion resistant properties are tabulated for titanium, Ti-3Al-5Cr, Ti-5Al-2.5Sn, Ti-6Al-4V, Ti-2.2 Fe-2.1Cr-2Mo, Ti-8Mn, Ti-3Mn-1.5Al and Ti-4Mn-4Al. Annealing and stress-relieving treatments and available forms. (Q general, P general, 17-2, R general; Ti)

1030-Q. Titanium Alloy Has Guarranteed Tensile Strength of 170,000 PSI. *Materials in Design Engineering,* v. 46, Oct. 1957, p. 180-181, 183. (CMA)

Ti-155A has a guaranteed tensile strength after heat treatment of 170,000 psi. and is claimed to be one of the strongest titanium alloys available in the mill annealed condition. Optimum heat treatments for this alloy. (Q27a, J27; Ti)

1031-Q. Ductility of Magnesium. *Metal Industry,* v. 91, Oct. 11, 1957, p. 319-320.

Crystallographic phenomena relating to magnesium under plastics deformation. (Q23p, Q24; Mg)

1032-Q. Parts Made of Selected High Strength Cast Steels. Robert J. Ely. *Precision Metal Molding,* v. 15, Nov. 1957, p. 39-40, 96-97, 108-109.

Properties of investment casting of high-strength steel.
(Q general; ST, 5-12)

1033-Q. Test Results Guide. High-Temperature Design of Bolted Assemblies. Steven S. Silwones and Robert A. Degen. *Product Engineering,* v. 28, Sept. 30, 1957, p. 79-83.

Stress-rupture strength, short-time tensile strength, coefficient of thermal expansion, notched sensitivity data for 7075-T6 aluminum, 4140 and 8740 steels, 17-7PH, 17-4PH and 422 modified stainless steels, A-286 alloy, Inconel X and 6AL-4V titanium; data on 100-hr. relaxation tests with bolt and locknuts from above materials. (Q general, P11g; SGA-h, Al, ST, SS, Co, Ni, Ti, 7-4)

1034-Q. The Normal Elastic Modulus of Alloys of Zirconium With Niobium. Yu. F. Buchkov, A. N. Rozanov and D. M. Skorov. *Soviet Journal of Atomic Energy,* v. 2, no. 2, 1957, p. 171-175. (CMA) (Translated by Consultants Bureau, Inc.)

Measurements of the normal elastic modulus up to 950° C. and at room temperature after various heat treatments. The elastic modulus of Zr was lowered by the addition of Cb, but the decrease in elastic modulus with temperature is much smaller for Zr-Cb alloys than for pure iodide zirconium.
(Q21a, 2-10; Zr, *Cb*)

1035-Q. Some Properties of Alloys of Zirconium With Niobium. Yu. F. Buchkov, A. N. Rozanov and D. M. Skorov. *Soviet Journal of Atomic Energy,* v. 2, no. 2, 1957, p. 165-170. (CMA) (Translated by Consultants Bureau, Inc.)

Phase diagram is shown for the system Zr-Cb. Measurements of tensile strength and elongation at room temperature, and an estimate of high-temperature strength on the basis of hardness measurements up

to 750° C. 5 ref.
(Q27a, 2-12, M24; Zr, *Cb*)

1036-Q. Test Reduces Overdesign Problem. *Steel,* v. 141, Oct. 7, 1957, p. 184-192.

New impact testing procedure measures properties of slack quenched steels. (Q6, 1-4; ST; 14-19)

1037-Q. Mechanical Properties of Alloys of the Uranium-Zirconium System. G. T. Muehlenkamp, W. Chubb and A. D. Schwope. *U. S. Atomic Energy Commission,* TID-10047, Oct. 20, 1953, 10 p. (CMA)

Induction-melted and arc-melted zirconium-uranium alloys were tested for tensile properties at 70 and 700° F. and for dynamic Young's modulus up to 1000° F. In general the zirconium-rich end of different phase fields was stronger, except for the $\varepsilon + \beta$ phase region. Elongation increased rapidly in the latter. The modulus of elasticity decreased as the zirconium content increased. (Q21, Q27a, M24b; U, Zr)

1038-Q. Impact Tests of Zircaloy 2-Hafnium Welds. H. R. Hoge. Westinghouse Atomic Power Division. *U. S. Atomic Energy Commission,* WAPD-RM-215, Dec. 30, 1953, 11 p. (CMA)

Tests show that the impact values for Zircaloy 2-hafnium welds increase with temperature up to 500° F.; beyond this point no breakage occurred. Data curves are shaped the same for welded samples and for solid metal samples. All the materials tested are stronger than crystal-bar zirconium. Prior heat treatment gave no advantage.
(Q6n; Zr, Hf, 7-1)

1039-Q. Effects of Neutron Bombardment Upon the Properties of Zircaloy-2. M. L. Bleiberg. Westinghouse Atomic Power Division. *U. S. Atomic Energy Commission,* WAPD-MDM-10, May 19, 1954, 15 p. (CMA)

Property changes in Zircaloy-2 after irradiation in the MTR. Electrical resistivity increased 15%, hardness increased 33 D.P.H., and notch toughness increased at high temperatures and decreased at low temperatures. 4 ref.
(Q general, P15g, 2-17; Zr)

1040-Q. Endurance Tests on SAR Zircaloy-3 Fuel Element Welds. A. B. Briggs. Knolls Atomic Power Laboratory. *U. S. Atomic Energy Commission,* KAPL-M-S3G-RE-507, Sept. 5, 1956, 11 p. (CMA)

An endurance testing machine was constructed to test SAR Zircaloy welds. Test results on five specimens tested to failure indicated that the quality and symmetry of the weld assembly is more significant than the number of weld passes.
(Q7; Zr, 7-1)

1041-Q. Examination of Zirconium Exposed to 190 MWD/AT. W. S. Kelly. Hanford Works. *U. S. Atomic Energy Commission,* HW-34820, Feb. 1, 1957, 7 p. (CMA)

Cold worked zirconium was irradiated to determine effects of exposure time on tensile properties, hardness and metallography. Lesser cold work gave about the same grain size although more twinning occurred with higher cold work. At about 30% cold work, larger grains begin to appear which grow still larger and more numerous with more cold work.
(Q27a, Q29n, M27, 2-17; Zr)

1042-Q. Interim Progress Report on the Creep-Rupture Properties of Zircaloy. Pt. 1. Extruded and Annealed Zircaloy-3. R. L. Mehan and F. W. Wiesinger. Knolls Atomic Power Laboratory. *U. S. Atomic Energy Commission,* KAPL-M-RLM-11, May 29, 1957, 16 p. (CMA)

Creep-rupture tests of extruded and annealed Zircaloy-3 at 600, 700 and 800° F. helium protective atmosphere. Curves of rupture strength, minimum creep rate and ductility values. Ductility showed no decrease with increasing time under load and increased with temperature. (Q3m; Zr)

1043-Q. Creep Properties of Metals Under Intermittent Stressing and Heating Conditions. Pt. 2. Intermittent Heating. L. A. Shepard, et al. University of California. (Wright Air Development Center.) *U. S. Office of Technical Services,* PB 131016, July 1954, 38 p. $1.00.

Intermittent heating, constant creep tests on aluminum alloys, clad 75S-T6 and clad 24S-T3. In the absence of solid state reactions, creep under intermittent heating conditions can be predicted from ordinary isothermal creep data. Equal creep strains are produced in equal net times at test temperature in intermittent heating and isothermal creep testing. Thus intermittent heating creep strains at any time may be estimated by summing the net time at test temperature and determining the strain for an equal time from an isothermal creep test. (Q3)

1044-Q. Minutes of Physical Metallurgy Symposium. Ordnance Department, Metallurgical Advisory Committee on Titanium. *U. S. Office of Technical Services,* PB 131105, Sept. 1955, 72 p. (CMA)

Symposium of 21 papers dealing with titanium alloy phase diagrams and transformation phenomena, mechanical properties of titanium and titanium alloys, and the effect of hydrogen and other interstitials on titanium. (Q general, M general, N general; Ti)

1045-Q. Investigation of Alloys of Magnesium and Their Properties. G. D. Foerster, et al. Dow Chemical Co. (Wright Air Development Center.) *U. S. Office of Technical Services,* PB 121801, Nov. 1956, 93 p. $2.50.

Development of improved magnesium wrought alloys for room and high-temperature service.
(Q general, 2-12; Mg)

1046-Q. Tensile Properties of Aircraft-Structural Metals at Various Rates of Loading After Rapid Heating. J. D. Morrison and J. R. Kattus. Southern Research Institute. (Wright Air Development Center.) *U. S. Office of Technical Services,* PB 121812, Nov. 1956, 199 p. $4.75.

Effects of variations in strain rate and holding time on the tensile properties of several metals after heating within 10 sec. to temperatures to 1200° F. Primarily directed toward effects on yield and ultimate strength. (Q27a, 3-17, T24a)

1047-Q. Creep Behavior of Magnesium Alloys. G. W. Pearsall and C. S. Roberts. Dow Chemical Co. (Wright Air Development Center.) *U. S. Office of Technical Services,* PB 121977, Dec. 1956, 24 p. $1.

Fundamental study of the mechanisms involved in tertiary creep in magnesium alloys. Sublimed magnesium was used as the test material. Emphasis was placed on obtaining intercrystalline failure, since creep failure in most commercial alloys occurs in this manner.
(Q3; Mg)

1048-Q. Intermittent Stressing and Heating Tests of Aircraft Structural Metals. J. Salvaggi. Cornell Aeronautical Laboratory, Inc. (Wright Air Development Center.) *U. S. Office of Technical Services,* PB 131210, May 1957, 76 p. $2.

C-110M titanium, A-70 titanium, type-321 stainless, N-155 alloy and 4130 steel were evaluated under conditions of combined intermittent temperature and load. Analysis disclosed little difference in creep and rupture behavior relative to the intermittent-load or intermittent-heat results. Basic mechanisms appear to be unaffected by the phase relationships of the combined cyclic-load and temperature conditions of the study.
(Q3, T24a, 17-7; Ti, SS, Co, AY)

1049-Q. (German.) **Development of Internal Stresses During the Casting of Cylinder Heads.** Kurt Bandow. *Geisserei,* v. 44, Sept. 26, 1957, p. 579-582.

Execution and results of measurements; effect of the shape of the cylinder heads on the magnitude of the internal stresses. (Q25, E25)

1050-Q. (German.) **Investigations on the Surface Hardenability of Different Types of Cast Iron.** Hans Schiffers, Dieter Ammann and Erich Brugger. *Geisserei,* v. 44, Sept. 26, 1957, p. 583-588.

Investigations of plain and low-alloy cast iron; effect of alloying elements on hardness; causes of surface defects. 7 ref.
(Q29a, 2-10; CI, 9)

1051-Q. (Italian.) **Measurement of Static and Dynamic Stresses.** *Metallurgia Italiana,* v. 49, July 1957, p. 494-508.

Types, applications, techniques of use of extensometers and electric dynamometers; determination of stresses by photo-elasticity; Drucker method of photo-elastic measurement; surface photo-elasticity; photo-elasticity of transparent tape; use of brittle coatings and X-ray techniques for stress analysis; optical measurement of displacements; problems of measurement of internal stresses. 25 ref. (Q25, X28, 1-2)

1052-Q. (Italian.) **Note on the Concentration of Stresses in Elliptical Fillets.** A. Erra. *Metallurgia Italiana,* v. 49, July 1957, p. 509-517.

Behavior of elliptical fillets under bending and tensile stresses was investigated. Theoretical factors of stress concentration were calculated by means of photo-elasticity; effective factors were determined by means of fatigue tests on specimens of normalized carbon steel and hardened and tempered Cr-Ni-Mo steel. Experimental results showed that elliptical fillets can, within clearly defined limits, reduce concentration of bending stresses; that

they offer no advantage as regards tensile stresses. 5 ref. (Q25k; CN, AY)

1053-Q. (Italian.) **Statistical Theory of Fatigue.** A. Ferro and R. Colombo. *Metallurgia Italiana,* v. 49, July 1957, p. 518-522.

Analytical study of S-N curves and Freudenthal theory of fatigue failure, plus analysis of reported results of fatigue tests by other researchers; designed to contribute to solution of problem of whether or not a fatigue limit actually exists. 19 ref. (Q7, S12)

1054-Q. (Italian.) **Fatigue Limit and Size Effect With Particular Reference to Case of Alternating Tensile-Compressive Stresses.** A. Pasetti. *Metallurgia Italiana,* v. 49, July 1957, p. 523-530.

Principal theories advanced to date in explanation of size effect are reviewed, theory of stress gradients being termed most logical. Results of series of push-pull tests on different sized plain and notched specimens of a C20 normalized steel are presented and analyzed on basis of this preferred theory; possibility is suggested of predicting fatigue limit of large parts theoretically. 10 ref. (Q7a; CN)

1055-Q. (Japanese.) **Study of Ti-V Cast Iron.** Takeshi Yamashita and S. Maekawa. *Casting Institute of Japan, Journal,* v. 29, Aug. 1957, p. 621-623. (CMA)

Effects of titanium and vanadium additions to cast iron. Metallic titanium and ferrovanadium were added in the ladle before pouring. An improvement in hypereutectic cast iron was achieved only when titanium and vanadium were added together. Improvements noted include increase in mechanical strength, good wear resistance and increased resistance to grain growth and oxidation. 15 ref. (Q general, 2-10, CI-q, *Ti, V*)

1056-Q. (Russian.) **Alloys of Titanium With Tungsten and Aluminum.** N. T. Gudtsov and I. P. Panchenko. *Akademiya Nauk S.S.S.R., Izvestiya, Otdelenie Tekhnicheskikh Nauk,* no. 2, Feb. 1957, p. 139-143. (CMA)

An experimental study of the possible advantages of the simultaneous presence of tungsten and aluminum in titanium alloys demonstrated advantages with regard to strength, hardness and refractoriness in alloys of titanium with 3% Al and 5, 10 and 15% W. Strength and hardness increase with tugnsten content. (Q general, 2-10; Ti, *W, Al*)

1057-Q. (Russian.) **Internal Friction of Aluminum-Magnesium Alloys on Deformation.** A. V. Grin and V. A. Pavlov. *Fizika Metallov i Metallovedenie,* v. 4, no. 1, 1957, p. 103-111.

Thermal relationship of internal friction of Al-Mg alloys on deformation. New maximum of internal friction dependent on magnesium diffusion. Value of the maximum shifts at higher temperatures with increase of magnesium concentration in solid solution. 18 ref. (Q22, 3-18; Al, Mg)

1058-Q. (Russian.) **Investigation of Deformation of Metals Under Small Strains. Pt. 1. Some Relationships of Aluminum and Copper Creep.** B. Ya. Yampolskii and T. A. Amfiteatrova. *Fizika Metallov i Metallovedenie,* v. 4, no. 1, 1957, p. 131-140.

Results of investigation of aluminum and copper wire creep under different conditions of deformation. Influence of microstructure and temperature upon creep. 10 ref. (Q3; Al, Cu, 4-11)

1059-Q. (Russian.) **Mechanism of Plastic Deformation and Mechanical Properties of Aluminum. Pt. 1. Study of Plastic Deformation Mechanism of Aluminum Based on Surface Markings on Stretching. Pt. 2. Formation of Blocks in Grains of Aluminum on Plastic Deformation.** E. S. Yakovleva. *Fizika Metallov i Metallovedenie,* v. 4, no. 1, 1957, p. 141-144; v. 4, no. 1, 1957, p. 145-150.

Results of deformation at −196, 18 and 250° C. and speed of 7.3 x 10^4, 73 and 2.3% per hr. Results of creep at 250° C. and speed of deformation of 0.1 and 4 x 10^{-3}% per hr. Photographs of specimens taken using microinterferometer technique; X-ray photographs and photographs in polarized light of specimens. 16 ref. (Q24; Al)

1060-Q. (Russian.) **Deformation Texture of Low-Carbon Steel on Cold Rolling.** K. V. Grigorov and G. P. Blokhin. *Fizika Metallov i Metallovedenie,* v. 4, no. 1, 1957, p. 161-170.

Relationship of texture development and degree of deformation. An attempt to explain the relationship considering geometry of plastic deformation of crystals on slipping. 9 ref. (Q24, M26c, CN-g)

1061-Q. (Russian.) **Change of Ductility of Transformer Steel on Cooling.** S. I. Doroshek, N. I. Lapkin and G. N. Shubin. *Fizika Metallov i Metallovedenie,* v. 4, no. 1, 1957, p. 171-176.

Certain problems of the kinetics of ductility change of hot rolled transformer steel on cooling, preceded by low-temperature annealing. Influence of cooling rate and temperature interval upon ductility of the steel. A maximum of the ductility dependent upon heat treatment. 2 ref.
(Q23p, J23; ST, SGA-n)

1062-Q. (Russian.) **Properties of Deformed Alloys of the System Titanium-Aluminum at Elevated Temperatures.** R. H. Nikitenko. *Metallovedenie i Obratbotka Metallov,* no. 8, Aug. 1957, p. 7-14. (CMA)

The strength of technical titanium at elevated temperatures, especially up to 700° C., is notably increased by additions of aluminum. Between 300 and 450° C. there is an important drop in the relative elongation value, which becomes a rather complicated function of the temperature. This points to an acceleration in the transition from a uniform to a localized deformation. Alloys containing more than 5% Al have a pronounced tendency toward aging at 400-500° C. This is attributed to the fact that the structure of such alloys is essentially heterophase. 11 ref.
(Q27a, 2-12; Ti, *Al*)

1063-Q. (Russian.) **Influence of Impurities Upon Properties of Chromium-Nickel Heat Resistant Alloys.** M. V. Pridantsev and G. V. Estulin. *Stal',* v. 17, July 1957, p. 636-640.

Extremely detrimental influence of lead, antimony and other low-melting, immiscible metals; effect of carbon, manganese and silicon. 13 ref. (Q general, 3-19; SS, SGA-h)

1064-Q. (Russian.) **Characteristics of Steel Impact Strength in Relation to Temperature and Shape.** T. A. Vladimirski. *Zavodskaia Laboratoria,* v. 23, July 1957, p. 830-837.

Results of impact strength testing of five grades of steel between −120 and 90° C. Notches in tested specimens were 2 mm. deep with a radius varying from 2 to 0.1 mm. 28 ref. (Q6n; ST)

1065-Q. (Russian.) **The Third Period of Creep and Stress Relaxation.** Ya. S. Gintsburgh. *Zavodskaia Laboratoria,* v. 23, July 1957, p. 838-842.

Graphs of creep and relaxation curves as well as irreversible deformation curves of chromium, nickel and manganese steels. Investigation of stress relaxation in high-alloy steels at 550 and 650° C. 10 ref.
(Q3; AY)

1066-Q. (Russian.) **The Third Period of Stress Relaxation Curve.** I. A. Oding and V. V. Burdukskii. *Zavodskaia Laboratoria,* v. 23, July 1957, p. 843-845.

General discussion of existence of a third period of stress relaxation similar to a well-established third period of creeping. 11 ref. (Q3)

1067-Q. (Russian.) **The Initial Period of Stress Relaxation in Metals.** V. Z. Tseitlin. *Zavodskaia Laboratoria,* v. 23, July 1957, p. 846-849.

First period of stress relaxation in steel is discussed and the graphs at 400, 450, 550 and 600° C. presented. 8 ref. (Q3)

1068-Q. (Swedish.) **New Results on the Importance of the Surface Effect in the Initiation of Fatigue Cracks.** O. Lissner. *Jernkontorets Annaler,* v. 141, 1957, p. 380-389.

Fatigue experiments on a quenched and tempered chromium-nickel-molybdenum steel confirmed the existence of a surface effect which contributes to the initiation of fatigue cracks. By nine times repeated turning of a thin surface layer the life of a fatigue test piece was increased 633%. 9 ref.
(Q7; AY)

1069-Q. (French.) **Softening and Recrystallization of Commercial Titanium Sheet.** A. Saulnier and R. Develay. *Revue de Metallurgie,* v. 54, Sept. 1957, p. 689-699. (CMA)

Effect of rate of work hardening on the mechanical characteristics and structure of commercial titanium sheet as a function of annealing conditions.
(Q general, N5, J23; Ti, 4-3)

1070-Q. (German.) **Strain in Structural Steel at High Temperatures.** Alfred Wyszominski. *Bergakademie,* no. 6, 1957, p. 312-317.

Determination of behavior of structural steel under steady load.
(Q28, 2-12; ST, SGB-s)

1071-Q. (German.) **A New Tool for Testing of Deep-Drawing Quality of Sheet Metals.** J. Rosenfeld. *Feingerate Technik,* v. 6, July 1957, p. 303-305.

Schiessl hand tongs which permit testing of material quickly on the spot without elaborate testing tools, lost time and damaged sheets. (Q23q, 1-3, 4-3)

1072-Q. (German.) **Absorption of Ultrasonic Waves in Metals at Very Low Temperatures in Normal and Superconductive Conditions.** G. Kurtze. *Naturwissenschaften,* v. 44, no. 13, July 1, 1957, p. 368-370.

Method for determining velocity and phase of waves; theory for estimation of absorption. 3 ref. (Q21f, 2-13)

1073-Q. (Japanese.) **Tubes for Low-Temperature Service.** Jimpei Omori, Eiji Miyoshi, Kazuo Kawano and Hidetoshi Maruoka. *Sumitomo Metals,* v. 9, Apr. 1957, p. 14-33.

Heat treatment, cold working and welding of steel. The quenched and tempered condition is most desirable and less than 10% reduction of cold working does not affect low-temperature service, but over 10% reduction reduces impact strength. A 25-20 Cr-Ni electrode is most suitable for welding. 12 ref. (Q6n, 2-13, J general, K1; ST, 4-10)

1074-Q. (Book.) **Strength of Materials.** F. R. Shanley. 783 p. 1957. McGraw-Hill Book Co., Inc., 330 W. 42nd St., New York 36, N. Y. $8.50.

A first text for college courses in engineering and science. Deals with data forming the basis for all types of structural analysis and design. Chapter headings include: analysis of stress, elastic and thermal strains, plastic strain, torsion, stress concentration and fatigue, and strength of joints and fittings. 105 ref. (Q general, Q25k)

1075-Q. (Book.) **Principles of the Properties of Materials.** Jacob P. Frankel. 228 p. 1957. McGraw-Hill Book Co., Inc., 330 W. 42nd St., New York 36, N. Y. $6.

Undergraduate text emphasizing properties rather than materials. Corrosion, elasticity, plasticity and fracture are given particular attention. (Q general, P general, R general)

1076-Q. (Book.) **Thermal Stresses.** B. E. Gatewood. 232 p. 1957. McGraw-Hill Book Co., Inc., 330 W. 42nd St., New York 36, N. Y. $7.50.

Basic information and possible procedures for solving those problems of thermal stress associated particularly with elevated temperatures in airplane and missile structures, turbines and nuclear reactors, directed especially to the engineer and aeronautical engineer. Design problems—temperature distribution; the elastic and inelastic thermal stresses in various structures; the combined elastic and inelastic applied and thermal stresses; the allowable stresses for various materials and loading conditions; the buckling, deflection, stiffness, fatigue, shock and flutter effects of elevated temperatures. (Q25p, Q general, 2-12)

1077-Q. (Book.) **Brittle Behavior of Engineering Structures.** Earl R. Parker. 323 p. 1957. John Wiley & Sons, 440 Fourth Ave., New York 16, N. Y. $6.

For the engineer and metallurgist responsible for the prevention of catastrophes. Theories and mechanism of failure; review of test methods for evaluating relative brittleness; interpretations and summaries of test results; effects of welding and composition variations on notch toughness; reports of service failures. (Q26s, 1-4)

SECTION R

CORROSION

1-R. Attack of Unstressed Metals by Liquid Mercury. J. F. Strachan and N. L. Harris. *Institute of Metals, Journal,* v. 85, Sept. 1956, p. 17-24.

Saturated solubilities and weight losses at room temperature of most of the metallic elements in static liquid mercury determined by chemical analysis of the solutions and weighing the specimens. (R6m; Hg)

2-R. (Dutch.) **Cathodic Protection.** J. W. Boon. *Metaalinstituut T. N. O.,* no. 42, July 1956, 14 p.

Cathodic protection according to electricity and electrochemistry, the electrolytic method and the criteria of perfect protection. (R10d)

3-R. (French.) **Iron and Steel Corrosion Caused by Water.** Marcel Pourbaix. *Centre Belge d'Etude et de Documentations des Eaux,* v. 3, no. 33, 1956, p. 192-208.

Influence of pH, oxidizers, reducers, chlorides, phosphates and temperature in steel and iron corrosion; techniques for the treatment of water and metals. (R4; ST)

4-R. (French.) **Incrustation—Corrosion—Priming.** R. Rath. *Centre Belge d'Etude et de Documentation des Eaux,* v. 3, no. 33, 1956, p. 209-216.

Some problems existing in boilers at high and at very high pressure. Practical suggestions for the future. (R4c; ST)

5-R. (French.) **An Attempt at a Theoretical Interpretation of the Solubility of Metals in Water.** Jean-Charles Pariaud and Pierre Archinard. *Journal de Chimie Physique,* v. 53, no. 9, Sept. 1956, p. 765-769.

Study of a limit of solubility and of its causes. Application of the Nernst equation for various metals. (R4, P12e)

6-R. (French.) **Corrosion of Aluminum and Some Alloys in Pure Water at High Temperature.** H. Coriou, L. Grall, J. Huré, P. Lelong and J. Hérenguel. *Revue de Métallurgie,* v. 53, no. 10, Oct. 1956, p. 775-790.

Influence of previous heat processing on corrosion in water when temperature exceeds 100° C. Processes identified were growth of a continuous and protective film, simultaneous intergranular penetration and dislocation and discontinuous pitting. (R4; Al)

7-R. (German.) **Corrosion Phenomena.** Fritz Tödt. *Chemiker-Zeitung,* v. 80, no. 20, Oct. 20, 1956, p. 698-703.

Types and mechanisms of corrosion including gaseous, stress and electrochemical attack. Protection and control considered. (R general)

8-R. (German.) **Effect of Steel Structure on Its Solubility Rate in Acid.** Otto Niezoldi. *Chemiker-Zeitung,* v. 80, no. 20, Oct. 20, 1956, p. 721-723.

Concludes that corrosion behavior in hydrochloric acid is influenced by the primary crystal structure. (R6g, M27, ST)

9-R. (German.) **Corrosion Study. V. Mechanism of Chemical Passivation and Corrosion of Metals.** M. Prazak and V. Prazak. *Collection of Czechoslovak Chemical Communications,* v. 21, no. 3, June 1956, p. 564-570.

Comparison of chemical and electrochemical passivations and corrosion of iron in nitric acid of various concentrations. (R10c, R6g; Fe)

10-R. (German.) **On the Problem of Intercrystalline Corrosion as Well as Corrosion Under Tension of Homogeneous Copper-Gold and Copper-Zinc and of Precipitable Aluminum-Zinc-Magnesium Solid Solutions. I.** Heinrich Klatte. *Werkstoffe und Korrosion,* v. 7, no. 10, Oct. 1956, p. 545-560 + 2 plates.

Investigates conditions under which tensile corrosion of homogeneous mixed crystals occurs, searches for a theory for the formation of cracks. Mercury causes a decrease of tensile strength.
(R2h, R1d; Au, Cu, Zn, Hg)

11-R. (Russian.) **Investigation of the Effectiveness of Cathodic Protectors Made of Aluminum-Zinc Alloys.** V. V. Gerasimov and I. L. Rozenfeld. *Izvestiia Akademii Nauk SSSR, Otdelenie Khimicheskikh Nauk,* 1956, no. 9, Sept. 1956, p. 1050-1052.

Investigation of stationary electrode potentials, magnitude of protective current, anodic polarization and stability of six alloys.
(R10d, Al, Zn)

12-R. Pitting and Cracking. U. R. Evans. *Chemistry & Industry,* 1956, no. 44, Nov. 10, 1956, p. 1291-1297.

Starting places of attack, electrochemical reactions, healing and spreading, corrosion patterns on zinc and iron, pitting on aluminum, spots on tin, pitting on zinc in distilled water, pitting and dislocations, intergranular corrosion, intergranular weakening stress corrosion cracking.
(R2j, R2h, R1d; Sn, Al, Zn, Fe)

13-R. Underground Aluminum Gas Line. R. S. Dalrymple. *Corrosion,* v. 12, Dec. 1956, p. 602-604.

In spite of satisfactory performance of the unprotected pipe tested, it is thought necessary to adequately coat lines in the future and to provide cathodic protection.
(R8, R10d, L26; Al)

14-R. Naphthenic Acid Corrosion—An Old Enemy of the Petroleum Industry. W. A. Derungs. *Corrosion,* v. 12, Dec. 1956, p. 617-622.

Corrosion rate depends on concentration of the naphthenic acids in the oil, operating temperature, fluid velocity and activity of the acids.
(R7a)

15-R. Corrosion of Type 347 Stainless Steel and 1100 Aluminum in Strong Nitric and Mixed Nitric-Sulfuric Acids. Charles P. Dillon. *Corrosion,* v. 12, Dec. 1956, p. 623-626.

Failure of stainless steel-clad tank was caused by severe vapor-phase corrosion. Replacement with aluminum was effective and economical. (R6g; SS, Al)

16-R. A High Potential Magnesium Anode. P. F. George, J. J. Newport and J. L. Nichols. *Corrosion,* v. 12, Dec. 1956, p. 627-633.

"Galvomag" will deliver from 20-30% more current to a polarized cathode than the conventional alloy anodes. Properties, composition, microstructure and field data.
(R10d; Mg)

17-R. Role of Minor Elements in the Oxidation of Metals. Earl A. Gulbransen. *Corrosion,* v. 12, Dec. 1956, p. 637-643.

Various impurities are considered in terms of their effects on the physical and chemical structure of the oxide, oxide-metal interface and metal. Eight types of effects illustrated. (R1h, 3-19)

18-R. What Does Corrosion Really Cost? W. B. Hirschmann. *Corrosion,* v. 12, Dec. 1956, p. 644-646.

By taking into account the effects of taxes and the time value of money, a measure is obtained of the cost of corrosion which is credible, meaningful in relation to other costs and the net earnings of an organization. (R general, A4s)

19-R. Stress Corrosion Cracking of Monel in Hydrofluoric Acid. H. R. Copson and C. F. Cheng. *Corrosion,* v. 12, Dec. 1956, p. 647-653.

The number and path of the cracks is influenced by composition, cold work, heat treatment, stress, time and conditions of exposure. Cracking is most prone to occur where corrosion rates are high, such as in moist, aerated vapor.
(R1d, R6g; Ni)

20-R. Deterrence of Hydrogen Blistering. B. W. Neumaier and C. M. Schillmoller. *Corrosion Technology,* v. 3, Nov. 1956, p. 357-361.

Major protective steps taken at fluid-unit gas plant were early removal of hydrogen sulphide and extensive water-washing starting at the fractionator overhead system.
(R2n; H)

21-R. Reduction of Corrosion in Ships' Cargo Tanks by Dehumidification. H. J. Dean. *Corrosion Technology,* v. 3, Nov. 1956, p. 362-363.

Observations of six tankers indicate that dehumidification works well, provided it is supplied in adequate quantities at sufficiently frequent intervals. (R10a)

22-R. Researches on Corrosion and Inhibition. Reaction Velocity in the System Iron: Dilute Acetic Acid at 40° C. George S. Gardner, Harry L. Faigen, Gregory L. Gibson and Wilbur S. Hall. *Franklin Institute, Journal,* v. 262, Nov. 1956, p. 369-384.

Equipment and procedure devised for studying the velocity of corrosion reactions under conditions where the amounts of corrodents, both liquid and gaseous, are under careful control. Two commercial corrosion inhibitors were selected for study. (R6g, R10b; Fe)

23-R. Corrosion-Fatigue. P. T. Gilbert. *Metallurgical Reviews,* v. 1, pt. 3, 1956, p. 379-417 + 2 plates.

Corrosion-fatigue testing, characteristics, effect of variations in corrosive environments, data for various materials, relationship of failures to microstructure, electrochemical aspects, protection against corrosion-fatigue. (R1e)

24-R. Explosions of Titanium and Fuming Nitric Acid Mixtures. L. L. Gilbert and C. W. Funk. *Metal Progress,* v. 70, Nov. 1956, p. 93-96.

The probability of a pyrophoric reaction depends upon the amount of water and NO_2 in the acid. (R6g, A7p; Ti)

25-R. Corrosion-Fatigue Testing in Highly Corrosive Media. W. P. McKinnell, Jr., F. H. Beck and M. G. Fontana. *News in Engineering at Ohio State University,* v. 28, Nov. 1956, p. 28-32.

Reverse-bending fatigue-testing machine was selected for conversion to corrosion-fatigue testing. For the fuming nitric acid corrosion-fatigue tests, titanium and stainless steel were the materials whose properties were investigated. (R1e; SS, Ti)

26-R. The Action of Sodium Hydroxide Melts on Alloys of Nickel, Molybdenum, and Iron at 815° C. G. P. Smith and E. E. Hoffman. *Oak Ridge National Laboratory (U. S. Atomic Energy Commission),* ONRL-2131, Nov. 1956, 7 p.

Reaction mechanism involves selective leaching of iron and molybdenum from solid solution with nickel and a resultant formation of subsurface porosity. Alloys containing at least 70% nickel showed more resistance to corrosion than others tested. (R6j; Fe, Ni, Mo)

27-R. Corrosion. Howard P. Kallen. *Power,* v. 100, Dec. 1956, p. 73-108.

Why metals corrode, corrosion types, combatting corrosion, testing, anticorrosion programs. (R general)

28-R. Temporary Protective Coatings for Metals. III. Corrosion Control by Cathodic Protection. E. Strong. *Product Finishing,* v. 9, Nov. 1956, p. 82-95, 128.

Electrode potentials of various metals. Theoretical aspects, current requirements, advantages of cathodic protection. (To be concluded.) (R10d)

29-R. Corrosion of Metals. F. Wormwell and E. L. Evans. Paper from "Chemical Engineering Practice". v. II. Academic Press. p. 255-341.

Principles, mechanisms, prevention. (R general)

30-R. (Czech.) **Resistance of Materials Used for High-Pressure Valves Against Erosion Action of Steam.** K. Löbl and F. Cerny. *Strojirenstvi,* v. 6, no. 10, Oct. 1956, p. 689-693.

Methods of testing the resistance of materials to erosion, comparison tests of various hard alloys, selection of adequate materials. (R11r, R4d)

31-R. (German.) **Oxidation of Refractory Carbide Alloys.** J. Hinnüber, O. Rüdiger and W. Kinna. *Technische Mitteilungen Krupp,* v. 14, no. 5, Nov. 1956, p. 140-142.

Influence of tungsten, chromium and tantalum additions on the oxidation of titanium carbide-cobalt alloys. Application to cobalt-free hard metals. Microscopic and X-ray examination of the oxide layers. (R2q, 2-10; EG-d, NO-a35)

32-R. (Russian.) **Gas Corrosion of Austenitic Steels at High Temperatures.** E. A. Davidovskaia and L. P. Kestel. *Metallovedenie i Obrabotka Metallov,* 1956, no. 10, Oct. 1956, p. 29-34.

Study of a series of heat resistant alloy steels relative to gas turbine installations. (R7g, 2-12; AY)

33-R. Cathodic Protection of an Active Ship Using Zinc Anodes. B. H. Tytell and H. S. Preiser. *American Society of Naval Engineers, Journal,* v. 68, Nov. 1956, p. 701-704.

High-purity zinc provided excellent protection; a useful life of four or five years is anticipated. (R10d; ST, Zn)

34-R. The Inhibition of Corrosion by Sodium Benzoate. J. H. Kaser. *Corrosion Prevention and Control,* v. 3, Nov. 1956, p. 37-40, 46.

The development and use of sodium benzoate as a corrosion inhibitor. The mechanism of such inhibition considered in the light of recent research. (R10b)

35-R. Corrosion Fatigue. A. J. Gould. Paper from "International Conference on Fatigue of Metals". v. II. The Institution of Mechanical Engineers. 9 p.

Testing, associated factors, methods of reducing the severity of attack. (R1e)

36-R. Corrosion Fatigue Cracking Resulting From Wetting of Heated Metal Surfaces, With Special Reference to Steam Power Plant. A. H. Goodger. Paper from "International Conference on Fatigue of Metals". v. II. The Institution of Mechanical Engineers. 9 p. + 6 plates.

Typical examples of cracking, conditions for cracking, mechanism of attack, effect of temperature on endurance, detection and remedial measures. (R1e, R4d)

37-R. Fatigue of Large Shafts by Fretting Corrosion. O. J. Horger. Paper from "International Conference on Fatigue of Metals". v. II. The Institution of Mechanical Engineers. 11 p. + 2 plates.

Fatigue resistance of press-fitted assemblies was comparatively less influenced by type of steel, tensile properties, or whether the shafts were normalized and tempered or quenched and tempered, than by subcritical quenching to obtain favorable residual thermal compressive stresses on the surface. (R1f; ST)

38-R. Fretting Corrosion and Its Influence on Fatigue Failure. A. J. Fenner, K. H. R. Wright and J. Y. Mann. Paper from "International Conference on Fatigue of Metals". v. II. The Institution of Mechanical Engineers. 10 p. + 4 plates.

Characteristics and mechanism of fretting, the fretting behavior of nonferrous surfaces, fretting corrosion and service failures.
(R1f, Q23g)

39-R. An Investigation on the Corrosion Fatigue of Marine Propeller Shafts. Saburo Hara. Paper from "International Conference on Fatigue of Metals". v. II. The Institution of Mechanical Engineers. 6 p. + 6 plates.

Fatigue strength of small steel specimens subjected to seawater corrosion; process of origination and growth of cracks; comparison between appearance of failure in small specimens and actual propeller shafts. (R1e, R4b; ST)

40-R. (English.) **On the Corrosion of Malleable Iron.** Nobuhisa Tsutsumi. *Castings Research Laboratory, Report, Waseda University,* 1956, no. 7, p. 19-23.

Tests with malleable iron revealed no superior corrosion properties.
(R general; CI)

41-R. (French.) **Corrosion of Iron and Steel by Water. Influence of pH, Oxidizing and Reducing Agents, Chlorides, Phosphates and Temperature.** Marcel Pourbaix. *Centre Belge d'Etude de la Corrosion, Rapport Technique,* no. 40, May 1956, p. 192-208.

Influence of these factors on the corrosive properties of ordinary and industrial waters in contact with iron and unalloyed steels was studied in connection with research on chemical and electrochemical equilibrium and speed of the reactions. Correct processes for anticorrosive treatment of water and metal were suggested.
(R4, R10a; ST)

42-R. (German.) **Corrosion, Cracking and Erosion on the Outer Surface of Copper-Alloy Condenser Tubing. II.** F. W. Nothing. *Metall,* v. 10, no. 21-22, Nov. 1956, p. 1033-1038.

Stress-corrosion; cracking and corrosion. Corrosion fatigue and erosion. (R1c, R1d, R1c; Cu)

43-R. (German.) **The Problems of Protection Against Corrosion and the Materials in Modern Acid Engineering.** Günter Schücking. *Werkstoffe und Korrosion,* v. 7, no. 11, Nov. 1956, p. 615-626.

Methods of protection against corrosion by acids and the construction of acid-proof installations and buildings. (R6g, T26; ST)

44-R. (German.) **Molybdenum in Chemical-Resistant Steels and Alloys.** L. Wetternik. *Werkstoffe und Korrosion,* v. 7, no. 11, Nov. 1956, p. 628-633.

Molybdenum is used as an alloying constituent in stainless steel and alloys for extensive improvement in the chemical resistance of martensitic and ferritic stainless steels.
(R6, 7; Mo, SS)

45-R. (German.) **The Behavior of Materials With Regard to Fluorine.** E. Lingnau. *Werkstoffe und Korrosion,* v. 7, no. 11, Nov. 1956, p. 634-641.

Resistant materials are 30% Cu nickel alloys, and for dry fluorine nonalloy steels, copper and aluminum. (R6q; Ni, Cu, ST, Al)

46-R. (German.) **The Oxidation of Titanium.** Per Kofstad and Karl Hauffe. *Werkstoffe und Korrosion,* v. 7, no. 11, Nov. 1956, p. 642-649.

Temperature-time relationships are established for the reaction.
(R1h; Ti)

47-R. (German.) **The Phenomenon of the So-Called "Phenol Corrosion" of Telephone Cables.** W. Hess. *Werkstoffe und Korrosion,* v. 7, no. 11, Nov. 1956, p. 649-652.

Concludes that the biological decomposition of the jute, and not phenol, is producing the special type of corrosion. (R1g; Pb)

48-R. (German.) **On the Behavior of Materials in Sulphuric Acid.** Erich Rabald. *Werkstoffe und Korrosion,* v. 7, no. 11, Nov. 1956, p. 652-662.

The behavior of metals and non-metals, influences of different additives on corrosion. (R6g, R10a)

49-R. (Italian.) **Protecting Ammonium Sulphate Crystallizers by Means of Inhibitors.** G. Roberti, F. Gianni and G. Bombara. *Metallurgia Italiana,* v. 48, no. 6, June 1956, p. 281-286.

Protective influence of 15 different materials. Copper sulphate, potassium bichromate, hydrogen peroxide and sodium arsenite develop a very good inhibiting action. (R10b)

50-R. (Polish.) **Investigation of Erosion-Corrosion Phenomena Caused by Neutral Salt Solutions Carrying Solid Suspensions.** M. Smialowski and J. Siejka. *Przemyst Chemiczny,* v. 12, no. 10, Oct. 1956, p. 569-571.

Loss in weight of two types of steel (T-45 steel of 0.10% chromium content and TR-2 steel of 1.14% Cr) was compared after rotating in solutions of sodium chloride containing suspended sand or silicon carbide. (R5c, R10r; ST)

51-R. (Russian.) **Distribution of Potential Along Piping Using Cathodic Protection.** N. A. Tsekun. *Energeticheskii Biulleten',* 1956, no. 10, Oct. 1956, p. 13-16.

A study of the divergence between theoretical calculations and practical data. Determination of the necessary corrections for existing formulas. (R10d)

52-R. (Russian.) **Passivity of Steel in Nitrose.** E. I. Litvinova. *Zhurnal Prikladnoi Khimii,* v. 29, no. 10, Oct. 1956, p. 1521-1529.

Formation of protective salt films on steel immersed in mixtures of sulphuric and nitric acids. (R10c, R6g; ST)

53-R. **The Failure of a Welded Drying Drum by Caustic Embrittlement.** George Sines and E. C. McLean. *Mechanical Engineering,* v. 78, Dec. 1956, p. 1105-1109.

An unusual failure caused by a design flaw and caustic embrittlement. (R1d, 18-17, 7-1)

54-R. **A.S.T.M. Copper-Strip Corrosion Standards.** R. C. Mallatt, P. A. Demkovitch and W. V. Cropper. *A.S.T.M. Bulletin,* no. 218, Dec. 1956, p. 49-51.

Mass reproduction of the standard strips using aluminum sheet, colored and cut to size, is reported. (R11, S22; Cu, Al)

55-R. **Defect Test on U-2 w/o Zr Alloy in the X-2 Loop Test No. 1.** R. F. S. Robertson and F. H. Krenz. *Atomic Energy of Canada Limited. CRDC-646,* April 1956, 32 p. (CMA)

A defected specimen of U-2Zr alloy, clad with Zircaloy-2 and diffusion bonded, was irradiated in a loop of a nuclear reactor. The loop contained water at 550° F. under 2000 psi. The object was to find if the corroding core metal released radioactive products in detectable amounts into the hot water, and to determine if the detection could be made in time to shut down the reactor. The defect (a hole) was plugged at first and no corrosion products entered the water. When the hole was opened they entered rapidly, while corrosion continued under the sheath. Detection is quick and allows shut down in time. (R11, S19; U, *Zr,* 9)

56-R. **Stress-Corrosion Cracking of Brass.** *Corrosion Technology,* v. 3, Dec. 1956, p. 407.

Study by the U.S. National Bureau of Standards on the relationship between crystal orientation and corrosion in alpha and beta brasses. (R1d, 3-22; Cu)

57-R. **Researches on Corrosion and Inhibition; Reaction Velocity of the System Iron-Dilute Acetic Acid at 40° C.** George S. Gardner. *Franklin Institute, Journal,* v. 262, Dec. 1956, p. 469-478.

Effects of inhibitors with and without addition of mineral spirits. (R10b)

58-R. **Aluminized Steel Stands Off Atmospheric Corrosion.** J. C. Merritt and W. E. McFee. *Iron Age,* v. 178, Dec. 27, 1956, p. 60-61.

Report on Armco aluminized steel Type-2 telling of its high resistance to atmospheric corrosion, good fabricating properties and favorable comparable costs. (R3, G general; ST, *Al,* 8-19)

59-R. **High Alloys Committee.** V. N. Krivobok. *Welding Research Council Yearbook,* 1956, p. 39-40.

The Arcos Corp. investigation on the effect of weld metal composition on the properties of Type-347 steel welds and the study being conducted by the Field Corrosion Subcommittee on the corrosion resistance of austenitic steel weldments are discussed. (R general, Q general; SS, 7-1)

60-R. The Corrosion Behavior of Zirconium and Its Alloys in High-Temperature Water and Steam. S. Kass. Paper from "Zirconium—Technology and Economics". Atomic Industrial Forum, p. 39-46. (CMA)

The corrosion of zirconium and its alloys in hot water proceeds by a low quasi-cubic rate law which transforms to a linear law. Small additions of iron, nickel or chromium, in conjunction with tin, improve corrosion resistance. Effects of impurities, such as titanium, aluminum, calcium, magnesium, chlorine and silicon, on the corrosion resistance are considered; most additions, other than those noted, are harmful. The high corrosion resistance of Zircaloy-2 is discussed. (R4d, 2-10; Zr)

61-R. Preservation of Stored War Material. J. L. McCloud. *Metal Progress,* v. 70, Dec. 1956, p. 84-85.

Favored method of protection against corrosion is storage under tight cover within which is circulated an atmosphere of controlled humidity. Vapor-phase inhibitors and contact preservatives also used. (R10e, R10b, T2)

62-R. Millions to Combat Rust. *Railway Age,* v. 142, Jan. 7, 1957, p. 25-27, 34.

International Nickel spends $7-million annually on research, much of it for research on corrosion resistant alloys and other corrosion problems. (R general, A9m; SGA-g)

63-R. The Effect of Heat Treatment on the Susceptibility of Sand Cast Aluminum Alloy 220 to Stress-Corrosion Cracking. Fred M. Reinhart. *Corrosion,* v. 13, Jan. 1957, p. 17-18.

Susceptibility decreased with increased rate of quenching from the solution heat treating temperature. (R1d, 2-14; Al)

64-R. Analysis of Corrosion Conditions Using Cable Sheath Current Measurements. J. M. Fouts and C. W. Bergerson. *Corrosion,* v. 13, Jan. 1957, p. 28-32.

"Zero Resistance Ammeter Method" for making large numbers of sheath current measurements is described. Application of current measurement data to corrosion analysis is discussed in detail. (R11m, T7g)

65-R. Effect of Hot Hydrogen Sulfide Environments on Various Metals. Frank J. Bruns. *Corrosion,* v. 13, Jan. 1957, p. 43-52.

Refinery corrosion tests of alloy steels and aluminum coated carbon steels were made and corrosion rates plotted, indicating that low-chromium steels are satisfactory provided the hydrogen sulphide-hydrogen ratio is lower than 100 ppm. Aluminum coated steels proved to have marked resistance to attack with best results achieved with calorized coatings. 11 ref. (R7k; AY, ST, *Al*)

66-R. High Temperature Sulfide Corrosion in Catalytic Reforming of Light Naphthas. Cecil Phillips, Jr. *Corrosion,* v. 13, Jan. 1957, p. 53-58.

Corrosion rates during operation on heavy naphtha varied from 0.15 to 0.4 in. on carbon steel and chromium alloys but the rate on 18-8 was about one-tenth that of the other metals. Chromium alloys through 12% in many instances showed corrosion rates higher than those of carbon steels. Aluminized steel generally showed good resistance at H_2S concentrations under 0.008 mol. percent. 7 ref. (R7k; CN, SS, *Al*)

67-R. Electrical Resistance Corrosion Measurements Employing Alternating Current. Wayne L. Denman. *Corrosion,* v. 13, Jan. 1957, p. 59-66.

Equipment and procedures discussed. Corrosion calculated from voltage drops, with increases in drop values directly proportional to amount of corrosion. 10 ref. (R11m)

68-R. Analysis of Corrosion Pitting by Extreme-Value Statistics and Its Application to Oil Well Tubing Caliper Surveys. G. G. Eldredge. *Corrosion,* v. 13, Jan. 1957, p. 67-76.

Detailed directions are given for the use of a special graphical method, known as the Pit Depth Rank Chart. 11 ref. (R2j, S12)

69-R. Corrosion of Structural Materials in High Purity Water. A. H. Roebuck, C. R. Breden, and S. Greenberg. *Corrosion,* v. 13, Jan. 1957, p. 87-90.

Materials showing the highest corrosion resistance included austenitic stainless steels, precipitation hardening stainless steels, cobalt alloys, platinum, titanium, zirconium, and hafnium. Those showing lowest resistance were copper, bronzes, magnesium, plain carbon steels and silver. 4 ref.
(R4e; SS, Co, Pt, Ti, Zr, Hf)

70-R. Corrosion Engineering Problems in High Purity Water. D. J. DePaul. *Corrosion,* v. 13, Jan. 1957, p. 91-96.

Attention is given to crevice, galvanic, intergranular and stress-corrosion as a function of the metals studied, which included 18-8 type stainless steel, cobalt base alloys, hard chromium plate, copper base alloys, nickel base alloys and straight chromium stainless steels.
(R4e; SS, Co, Cu, Ni, *Cr*, 8-12)

71-R. The Importance of High Purity Water Data to Industrial Applications. W. Z. Friend. *Corrosion*, v. 13, Jan. 1957, p. 97-101.

A review of available information on plant experience indicates that corrosion resistant metals such as stainless steels, nickel alloys, or aluminum are generally required to handle high purity water. 27 ref.
(R4e; SS, Ni, Al)

72-R. Corrosion Problems Arising From the Use of Aluminum Alloys in H.M. Ships (2). J. C. Kingcome. *Corrosion Prevention and Control*, v. 3, Dec. 1956, p. 37-40.

Examples of corrosion: wrong choice of alloy, faulty design, contact with steel, contact with copper alloys. (R general, T22; Al)

73-R. Pitting Corrosion of Reserve Fleet Ships. E. F. Corcoran and J. S. Kittredge. *Corrosion Prevention and Control*, v. 3, Dec. 1956, p. 45-48.

Sewage into San Diego Bay, resulting in oxygen supersaturation responsible for electrochemical corrosion of ships' plating. 12 ref.
(R2j, T22g; ST)

74-R. Protective Film on Titanium in Hydrochloric Acid. Rikuro Otsuka. *Journal of Metals*, v. 9, Jan. 1957, p. 75-76.

Experiments indicate film may be a hydride. Techniques are discussed which are believed to produce hydrides or to remove them prior to hydrochloric acid tests. 4 ref.
(R10c, R6g; Ti)

75-R. Corrosion Testing of Zirconium, Zircaloy and Hafnium. J. S. Theilacker. *U.S. Atomic Energy Commission. AECU-3260*, May 26, 1956, 6 p. (CMA)

Specifications are given for the corrosion testing of core components, and for quality control coupons. Procedures for testing, handling of equipment and precautions for handling radioactive materials are discussed. A schedule is presented for the testing of various items.
(R11, A7r; Zr, Hf)

76-R. The Effect of Cold and Hot Drawing on the Corrosion Resistance of Zircaloy-2. H. J. Snyder. *U.S. Atomic Energy Commission. WAPD-FE-896*, June 30, 1955, 10 p. (CMA)

Hot and cold-drawn samples of Zircaloy-2 were subjected to 750° F. steam for 86 days. Drawing 54% by either the hot or cold method had no effect on the corrosive weight gain beyond the normal 77 mg. per sq. dm. Methods of restoring corrosion resistance to Zircaloy-2 after fabrication were considered. Tests showed that the removal of 0.004 in. from the surface by abrasion or 0.0003 in. by etching with 35% HNO_3-5% HF at 160° F. would restore the normal corrosion resistance. (R general, 3-18; Zr)

77-R. The Oxidation of Zirconium and Zirconium Alloys in Air. H. R. Hoge. *U.S. Atomic Energy Commission. WAPD-MDM-11*, May 24, 1954, 28 p. (CMA)

A study of the practical limit for heating strips of zirconium and zinc alloys involved experimentation and a survey of the literature. Ingots may be safely heated to 1800° F. but strip should not be heated in air above 1500° F. The rate of oxidation increases with temperature until oxygen diffuses into the center of the strip; excessive warping also occurs. 3 ref. (R1h; Zr)

78-R. Report of October 1954 Meeting of the Zirconium Alloy Corrosion Committee. S. Kass. *U.S. Atomic Energy Commisssion. WAPD-MM-713*, Nov. 30, 1954, 133 p. (CMA)

Reports are given on the Zircaloy-3 development program, including corrosion resistance and mechanical properties. The alloys, which are variations on the Zircaloy-2 composition, are promising. Corrosion resistance is adversely affected by Ti, Cb, Mo, Cu, W, Al and Mn; beryllium had no effect and cobalt was beneficial. Sample thickness had no effect and tests in 800, 850 and 900° F. steam showed poor correlation between pressure and corrosion. Resistance was good at 550, 600, 680 and 750° F. after 350-430 days. Weight gain at "breakaway" increases with temperature. (R general, 2-10; Zr)

79-R. Evaluation of Hafnium Crystal Bar. R. B. Stermon. *U. S. Atomic Energy Commission, WAPD-TN-521*, Aug. 1955, 41 p. (CMA)

Hafnium crystal bar was evaluated for corrosion resistance in its application as a control rod in a statistical way. All specimens ex-

cept those in the "very bad" category had adequate corrosion resistance and mechanical properties. Dilution with "good" material may be feasible in producing acceptable stock. The procedures are described. (R general, Q general, T11j; Hf)

80-R. (German.) **Scaling of Pure Iron and Scaling in General.** Norbert G. Schmahl, Hans Baumann and Hermann Schenck. *Archiv für das Eisenhüttenwesen,* v. 27, Nov. 1956, p. 707-713.

Excess temperatures caused by the heat of reaction of the scaling process are recognized as the reason for deviations from the parabolic scaling law. 28 ref. (R1h; Fe-a)

81-R. (German.) **Formation of a Protective Layer on Titanium in Hydrochloric Acid.** *Zeitschrift für Metallkunde,* v. 47, no. 11, Nov. 1956, p.714-715. (CMA)

Samples cut from rolled and polished titanium sheets were immersed for 7 days at room temperature in hydrochloric acid of various concentrations. It was observed that a corrosion resisting coating was formed whose properties depended on the concentration of the acid; the density and mechanical strength of coatings increased with decreasing HCl concentration. Electron diffraction diagrams showed that the coatings consisted of titanium hydrides. 8 ref. (R10c, R6g; Ti)

82-R. Corrosion of Titanium. D. W. Stough, F. W. Fink and R. S. Peoples. *Battelle Memorial Institute. Titanium Metallurgical Laboratory. Report 57,* Oct. 1956, 184 p. (PB 121601) Abstracted in: *U.S. Government Research Reports,* v. 27, Feb. 15, 1957, p. 60. (CMA)

The corrosion properties of titanium and its alloys are reported including corrosion rates in a number of environments. Industrial and military experiences with titanium corrosion are cited. The passivating processes of titanium were studied. (R general; Ti)

83-R. Cathodic Protection for Small Shipping. M. G. Duff and I. D. G. Graham. *Corrosion Technology,* v. 4, Jan. 1957, p. 9-12.

Discussion of anodes and anode requirements for small vessels, such as small bulk, low output and relatively long working life. (R10d)

84-R. Mercury Compositions on Aluminum Alloy Hull Plating. E. G. West. *Corrosion Technology,* v. 4, Jan. 1957, p. 13-14.

Corrosion results on the hull of an aluminum alloy motor boat, coated with anti-fouling composition containing mercury, and suggested remedial measures. 3 ref. (R4b; Al)

85-R. Corrosion Congress, Paris, Nov. 1956. *Corrosion Technology,* v. 4, Jan. 1957, p. 25-28.

Abstracts of papers presented covering various fields of corrosion technology and a symposium on aluminum corrosion. (R general; Al)

86-R. Controlling Corrosion. T. J. Hull. *Industrial and Engineering Chemistry,* v. 49, Jan. 1957, p. 103A-104A.

Titanium and tantalum as corrosion resistant materials; hydrogen sulphide corrosion in oil refinery catalytic reformers; and measurement of instantaneous corrosion rate. 4 ref. (R7k; Ti, Ta)

87-R. High Temperature Oxidation Characteristics of Some Manganese Steels: Part II. Ved Prakash and A. A. Krishnan. *Journal of Scientific and Industrial Research,* v. 15B, Oct. 1956, p. 600-607.

Metallography of the oxides formed at 600 and 700° C., effect of temperature on oxidation of manganese-aluminum steel, influence of composition. 10 ref.
(R1h, M27, 2-12; ST, *Mn, Al*)

88-R. Nomograph Gives Numerical Estimation of Galvanic Corrosion. Harold Blye. *Machine Design,* v. 29, Jan. 10, 1957, p. 139.

Nomograph of galvanic corrosion and its use. (R1a)

89-R. Corrosion Is a Complex Problem for Refiners. Part I. Thomas M. Krebs. *Oil and Gas Journal,* v. 55, Jan. 14, 1957, p. 131.

Presentation of corrosion of ferrous tubing materials. To be continued. (R7a; Fe, 4-10)

90-R. Temporary Protective Coatings for Metals. Five Essential Requirements. E. Strong. *Product Finishing,* v. 10, Jan. 1957, p. 79-91.

Data on performance of corrosion inhibitors and their chemical and physical characteristics. (R10f)

91-R. An Investigation of Scaling of Zirconium at Elevated Temperatures. Quarterly Status Report No. 14. E. B. Evans and W. M. Baldwin, Jr. *U.S. Atomic Energy Commission. AECU-3382,* Dec. 4, 1956, 7 p. (CMA)

Instantaneous scaling rates of zirconium were calculated for vari-

ous media and duplex treatments. The distribution of nitrogen and/or oxygen reacting with zirconium was studied; the gas is distributed during scaling between the scale and the metal (outer layers). Depth of absorption depends on scaling temperature and time; oxygen penetrates faster than nitrogen. The amount of gas dissolving before the break in scaling rate at 900° C. is the same as that dissolving afterwards. (R2q, 2-12; Zr)

92-R. Scaling of Zirconium at Elevated Temperatures. Technical Progress Report No. 3. E. B. Evans and W. M. Baldwin, Jr. *U.S. Atomic Energy Commission, AECU-3386,* Dec. 1956, 32 p. (CMA)

High-temperature scaling studies for zirconium reveal spectacular effects when scaling occurs in air within a critical temperature range: extreme dilation laterally, increased scaling rate, and a change from dense black scale to white porous scale. These phenomena depend on time, temperature, gas composition, and shape, thickness and purity of the sample. The critical range is 600-1050° C. None of the phenomena occurred in pure gas. The role of each of the variables was investigated. (R2q, 2-12; Zr)

93-R. The Corrosion Behavior of Some Zirconium-8 Wt. % Uranium Alloys of 680° F. Water. D. C. Belouin. *U.S. Atomic Energy Commission, KAPL-M-DCB-1,* Dec. 5, 1956, 16 p. (CMA)

Static corrosion tests were conducted in 680° F. water; results are reported for 4000 hr. of testing. Quenching the alloy from 1000° C. gives a more corrosion resistant structure than annealing at 575° C. An important effect on corrosion is indicated for minor alloying elements. Frequent inspection greatly affected the corrosion rate. (R4a, 2-10; Zr, *U*)

94-R. An Investigation of Scaling of Zirconium at Elevated Temperatures. Quarterly Status Report No. 12 for March 2, 1956 to June. C. A. Barrett, et al. *U.S. Atomic Energy Commission, AECU-3257,* June 11, 1956, 4 p. (CMA)

Sintering and self-heating effects and the role of hydrogen were studied in an investigation of zirconium scaling at high temperature. No exothermic reaction was observed on the breakaway of scales, nor did scales sinter after heating in air to 1100° C. for 24 hr. Hydrogen pickup from pickling in H_2SO_4 was shown to have no significant effect on scaling unless saturation is complete. (R2q, 2-12; Zr)

95-R. The Relative Corrosion Resistance of Titanium and Some of Its Alloys. L. B. Golden, W. L. Acherman and D. Schlain. *U.S. Bureau of Mines, Report of Investigations 5299,* Jan. 1957, 25 p. (CMA)

The alloys Ti-7.6Mn, Ti-1.8Cr-O.9 Fe and Ti-2.7V-2.7Fe were evaluated and compared with titanium for corrosion resistance in H_2SO_4, HCl, H_3PO_4, HNO_3, mixed acids and chloride solutions. HCl is less corrosive to powder metallurgy titanium than to arc-melted titanium, but the situation is reversed for H_2SO_4 and H_3PO_4. Ti-2.7V-2.7Fe is more resistant but the others are less so. Embrittlement is proportional to the corrosion rate. Corrosion studies of Ti-Zr alloys show improved resistance with increased zirconium content. 26 ref. (R6g; Ti)

96-R. High Pressure Oxidation of Metals. Technical Report No. 6. Molybdenum in Oxygen. R. C. Peterson and W. M. Fassell. *University of Utah, Department of Metallurgy, Report for Department of the Army Project 599-01-004,* Sept. 1954, 19 p. (PB 123817). Abstracted in *U.S. Government Research Reports,* v. 27, Jan. 18, 1957, p. 19. (CMA)

The temperature and pressure dependence of the corrosion of molybdenum in oxygen was studied in the ranges 525-700° C. and 1-47.6 atm. Molybdenum oxidizes linearly from 525 to 650° C. at all pressures. (R1h, 2-11, 3-24; Mo)

97-R (French.) **A Study of the Oxidation in Air of Kroll Zirconium in the Heated State.** Jean Hérenguel, Donald Witwham and Jacques Boghen. *Académie des Sciences, Comptes Rendus des Séances,* v. 243, Dec. 17, 1956, p. 2060-2063. (CMA)

The known phenomenon of the oxidation in air of Kroll zirconium in the heated state, resulting in various volume increases of the sample depending on the temperature and sample thickness, may be explained by the fact that the resistance of zirconium to flow decreases considerably above 400-500° C. and that the transformation of zirconium into the oxide is accompanied by a volume increase of about 50%. It is indicated that generally the self protection of a metal, achieved by a

layer formed when the volume is increased, ceases in the temperature range of viscous deformation. To increase this self protection attempts should be made to increase the resistance of the metal to flow or to render the protecting layer more viscous. 1 ref. (R1h; Zr)

98-R. (German.) **Corrosion Tests With Simultaneous Emanation Effect.** K. Lintner, E. Nachtigall and E. Schmid. *Metall,* v. 11, Jan. 1957, p. 31-35.

Damage due to corrosion, in the health tunnel at Boeckstein, led to experiments in which it was shown the hydrogen peroxide present in addition to salt and moisture caused increased corrosion of iron and aluminum. Radioactive emanations in the tunnel may increase the hydrogen peroxide content and thereby corrosion. 2 ref. (R6p, 2-17; Fe, Al)

99-R. (Italian.) **Factors in the Evaluation of the Corrosivity of Waters.** G. Bombara and F. Gianni. *Metallurgia Italiana,* v. 48, Nov. 1956, p. 503-512.

Natural waters and inhibited waters and solutions studied for effects on ordinary construction steel at ambient temperature. Concludes impossibility of defining corrosivity of an electrolytic medium on a given metal unless all corrosion conditions specified; that most adequate method appears to be determination of break point on cathode polarization curve. 11 ref. (R4, R11m; CN)

100-R. (Report.) **Solubility and the Products of Reaction Between Iron and Water at 26° and 300° C.** V. J. Linnenbom, J. I. Hoover and H. S. Dreyer. 15 p. Sept. 1956. U.S. Naval Research Laboratory, U.S. Office of Technical Services, P.B. 121409, Washington 25, D. C. $.50.

Deposits of magnetite resulting from a water-iron reaction in a pressurized water reactor whose primary coolant vessel is of stainless or low-carbon steel. (R4, T11; Fe, Cn-g, SS)

101-R. Study of a Size Effect in Galvanic Corrosion. James T. Waber. *Corrosion,* v. 13, Feb. 1957, p. 25-32.

Distribution of potential within a corrodent was analyzed using several geometric arrangements of electrodes which lay in a common surface. Distribution of corrosion attack over anode studied. It was found that potential of a galvanic couple depended on relative areas of electrodes, as well as on their open cell potentials. 23 ref. (R1a)

102-R. Use of High Silicon Cast Iron for Anodes. NACE Technical Unit Committee T-2B on Anodes for Impressed Currents. *Corrosion,* v. 13, Feb. 1957, p. 33-37.

Reports of data received in reply to questionnaires, which indicate high-silicon cast iron anodes can be expected to perform satisfactorily both with and without coke breeze ground beds. (R10d, 17-7; CI, *Si*)

103-R. An Impressed Current Cathodic Protection System Applied to a Submarine. E. E. Nelson. *Corrosion,* v. 13, Feb. 1957, p. 52-54.

Platinum-clad copper anodes were employed. Inspection after a ten-month period showed the hull to be in excellent condition. Laboratory tests indicate desirability of replacing copper anode core by a silver core. (R10d, 17-7; Cu, Ag)

104-R. Cathodic Protection of an Active Ship Using a Trailing Platinum-Clad Anode. H. S. Preiser and F. E. Cook. *Corrosion,* v. 13, Feb. 1957, p. 55-61.

Advantages of trailing anode over existing hull-mounted anode systems, and speculation as to future possibilities in the marine field. 11 ref. (R10d, 17-7; Pt)

105-R. Casing Corrosion in the Petroleum Industry. Jack L. Battle. *Corrosion,* v. 13, Feb. 1957, p. 62-68.

Areas in which casing corrosion is most troublesome. Investigation, repairing and prevention discussed. 11 ref. (R7a)

106-R. Lead Cable Sheath Corrosion Under Cathodic Protection Conditions. Walter H. Bruckner and Ray M. Wainwright. *Corrosion,* v. 13, Feb. 1957, p. 73-78.

Laboratory tests were conducted in cells containing aqueous solutions of chlorides and alkali and with soil saturated with the various solutions. Results indicated that no corrosion of cable sheath occurred so long as the cathode was receiving protective current. Suggested factors for service-type failures. 11 ref. (R10d; Pb)

107-R. The Standard Salt-Spray Test—Is It a Valid Acceptance Test? A. Mendizza. *Plating,* v. 44, Feb. 1957, p. 166-171.

Test results from four different testing boxes of chromium plated on nickel or copper coated steel were not consistent. Similar platings from six sources gave inconsistent results; apparently salt spray procedure as

currently practiced fails to perform as a standard test. (R11j)

108-R. (French.) **Findings on the Chemical Activity of Water and the Composition of the Products of Incrustation and Corrosion.** T. Samuel. *Révue Technique Luxembourgeoise,* no. 4, Oct.-Dec. 1956, p. 205-207.

Chemical nature of the several types of corrosion in water mains; inhibiting factors and methods of prevention. (R4a, R10b)

109-R. Solving Unexpected Corrosion Problems. G. D. Gardner. *Chemical Engineering,* v. 64, Feb. 1957, p. 292-300.

Correction of corrosion problems of sulphuric acid: high-velocity steam corroded steel pipe elbows; sulphuric acid containing carbon caused galvanic corrosion of alloys; corrosion of copper by sulphur dioxide. (R6g, R6p, R4d; ST, Cu)

110-R. Electrochemical Corrosion in Relation to Engineering Design. S. L. Chawla. *India Section, Electrochemical Society, Bulletin,* v. 5, Oct. 1956, p. 78-82.

Factors leading to galvanic corrosion and their practical implication. Corrosion of a single structure or a metal piece may be due to one or more causes. Protective measures discussed. 10 ref. (R1a, 17-1)

111-R. Corrosion Resistance of Copper and Copper-Base Alloys. A. I. Heim. *Industrial and Engineering Chemistry,* v. 49, Feb. 1957, p. 79A-80A.

Brief description of pitting, dezincification, corrosion-fatigue, stress-corrosion cracking and galvanic corrosion in copper and copper alloys. (R1, R2; Cu)

112-R. Short Period Testing With a New Corrosion Test Chamber. W. Hess. *Industrial Finishing,* v. 9, Jan. 1957, p. 342-345.

Experimental results for salt spray corrosion tests obtained with aerosols centrifugally produced indicated a versatility in producing corrosion conditions. Test results were reproducible. (R11j)

113-R. Corrosion in Scotch Marine Boilers I. Model Boiler Tests on the Corrosion of Mild Steel Tubes in Highly Saline Waters. F. Wormwell, G. Butler and J. G. Beynon. *Institute of Marine Engineers,* Preprint, Feb. 1957, 12 p.

Model boilers have been used to carry out qualitative and semiqualitative experiments on the corrosion of internally heated boiler tubes in conditions simulating those in Scotch boilers. The depth of pitting on mild steel boiler tubes in distilled water with additions of sea water increases with the density of the solution. 11 ref. (R4b, W11, 17-7; CN)

114-R. The Protection of Structural Steelwork Against Atmospheric Corrosion. F. Fancutt. *International Association for Bridge and Structural Engineers, Publications,* v. 16, 1956, p. 185-230.

Influence of climate on the severity of atmospheric rusting, effect of steel composition on rusting, general survey of protective measures and design, general principles governing the use of protective coatings, protection by painting and metallic coatings.
(R3, L general; ST, SGB-s)

115-R. Effect of Alternate Corrosion and Abrasion on Some Ferrous Metals. J. Dearden and J. D. Swindale. *Iron and Steel Institute, Journal,* v. 185, Feb. 1957, p. 227-234.

The resistance of 11 ferrous metals to atmospheric corrosion, to abrasion, and to certain combinations of both, have been compared. Resistance to abrasion alone was found to be related to a defined equivalent carbon content of the steels tested rather than to their hardness. 12 ref. (R3, Q9n; CI, ST)

116-R. Corrosion of Titanium. D. W. Stough, F. W. Fink and R. S. Peoples. *Light Metal Age,* v. 15, Feb. 1957, p. 20-22. (CMA)

Titanium corrosion resistance is good in general and is especially valuable in environments of sea water, HNO_3, chromic and acetic acid, ferric and cupric chlorides. It is possible to inhibit the attack of HC1, H_2SO_4, $(COOH)_2$ and HCOOH, but the attack of HF cannot be inhibited. Galvanic attack of the other metal in a galvanic couple is a problem. Titanium is subject to crevice corrosion in some acid environments; reactions with corrosive environments are often complex. There is a tendency to polarize the galvanic current between titanium and other metals. (R general; Ti)

117-R. Close Tolerance Wrought Iron Tubing. H. K. Siefers, Jr. *Materials and Methods,* v. 45, Feb. 1957, p. 116-117.

Availability of cold drawn tubing with close tolerances allows use in corrosive environments where wrought iron performs well.
(R general; Fe-m, 4-10)

118-R. Heat Exchanger Corrosion. *Metal Industry,* v. 90, Feb. 1, 1957, p. 89-90.

Use of dissimilar metals of widely varying electrode potential caused the corrosion. (R1a, W13, 17-7)

119-R. Acid Resisting Property of High Chromium Stainless Steels. Masayoshi Tagaya and Shigeteru Isa. *Osaka University, Technology Reports,* v. 5, Oct. 1955, p. 433-440.

Several 20-27% chromium stainless steels containing 5 or 10% nickel, 1% molybdenum and 1% copper were examined. The effect of heat treatment from 700 to 1100° C. and the effect of additions of inhibitors to the boiling acid solution on the stabilization of the acid resistance. (R6g, R10b, 2-14; SS)

120-R. (English.) **Corrosion Testing Stations of the French Iron and Steel Industry.** *Aciers Fins et Spéciaux Francais,* no. 24, Dec. 1956, p. 10-14.

Material damage due to corrosion; methods of studying corrosion; survey of the equipment and operating possibilities of the French corrosion testing stations located at St. Germain-en-Laye, Saint Denis and Biarritz. 13 ref. (R11, A9h)

121-R. (French.) **Oxidation at High Temperatures of Nickel-Chromium Alloys.** J. Moreau. *Corrosion et Anticorrosion,* v. 4, June 1956, p. 211-216.

Formation of oxides; photomicrographic studies of oxidation; résistance to corrosion. 7 ref. (R1h, 2-12; Ni, Cr)

122-R. (French.) **Protection Against Humidity in the Storage and Shipment of Material, With Special Reference to Motors, by Means of Dehydrating Agents.** R. Baudoin. *Corrosion et Anticorrosion,* v. 4, June 1956, p. 222-224.

Principal dehydrating agents and their mode of action; protection problems concerning humidity in the aeronautical industry and progress currently realized. (R3, R10a)

123-R. (French.) **Corrosion by Steam and Distilled Water Circuits—Causes and Prevention.** J. Pierrey. *Corrosion et Anticorrosion,* v. 4, June 1956, p. 225-230.

Corrosive character of steam and its causes; chemical nature of such corrosion; methods of prevention including caustic soda and film-forming amines resulting in effective corrosion inhibiting factors and reduction in industrial costs. 6 ref. (R4d, R10b)

124-R. (French.) **On the Morphology of Superficial Oxide Films.** R. Collongues and R. Sifferlen. *Journal de Chimie Physique et de Physico-Chimie Biologique,* v. 53, Oct. 1956, p. 803-809.

Mechanism of oxidation; formation and structure of oxide films on metal surfaces; crystal growth; diffusion processes. 12 ref. (R1h, N1)

125-R. (French.) **Reactions of the Iron-Nickel Alloys With Oxygen.** M. J. Brabers, W. J. Heidiger and C. E. Birchenall. *Journal de Chimie Physique et de Physico-Chimie Biologique,* v. 53, Oct. 1956, p. 810-816.

Study of the oxidation of iron-nickel alloys of various compositions at 1050 to 1095° C.; rate of oxidation; microscopic, X-ray and chemical analysis to determine structure and composition of oxide films. 10 ref. (R1h; 1-4; Fe, Ni)

126-R. (French.) **Note on the Growth of Films on Metals.** T. P. Hoar. *Journal de Chimie Physique et de Physico-Chimie Biologique,* v. 53, Oct. 1956, p. 826-831.

Theoretical study of the speed of oxidation and the variables influencing this process; elaboration of equations of growth and structural formulae; rate-determining factors. 19 ref. (R1h, 3-17)

127-R. (French.) **On the Mechanism of Oxidation of Metals by Nonparabolic Law.** Karl Hauffe. *Journal de Chimie Physique et de Physico-Chimie Biologique,* v. 53, Oct. 1956, p. 855-870.

Migration processes and phase boundary reactions during oxidation; parabolic law of growth; logarithmic rate law; oxide = metal interfaces; interaction between diffusion processes and phase-boundary reactions. 39 ref. (R1h, 3-17, Ni)

128-R. (French.) **Results of Research Into the Kinetics of the Oxidation of Molybdenum and Tungsten and Into the Nature of the Resultant Oxides.** K. M. Gorbounova and V. A. Arslambékov. *Journal de Chimie Physique et de Physico-Chimie Biologique,* v. 53, Oct. 1956, p. 871-883.

Oxidation of molybdenum and tungsten in various conditions of temperature and pressure; structure of oxide film; kinetic curves relating to the interaction of oxygen with the metal surfaces; equations based on experimental data. 9 ref. (R1h, M26r; Mo, W)

129-R. New Data on Stress-Corrosion Cracking of Brass. *ASTM Bulletin,* no. 220, Feb. 1957, p. 37.

National Bureau of Standards investigation of the relationship between crystal orientation and stress-corrosion cracking in alpha and beta brasses. (R1d, 3-22; Cu-n)

130-R. Thermogalvanic Potentials and Currents at Aluminum Surfaces in Industrial Water. E. C. Pitzer. *Electrochemical Society, Journal,* v. 104, Feb. 1957, p. 70-74.

Potentials and galvanic currents at 2S aluminum surfaces in Columbia River water were studied between room temperature and 100° C. The Al potential changed by approximately 0.6v over this interval, becoming more anodic with increase in temperature. Similar but somewhat smaller changes in potential were noted in buffer solutions. 20 ref. (R4a; Al)

131-R. Corrosion Problems in Aircraft. Part I and II. A. T. Pal. *Institution of Engineers, Journal* (India), v. 37, no. 4, Part 2, Dec. 1956, p. 353-357.

Corrosion problems in aircraft are associated with a wide range of metals and their alloys, such as aluminum, magnesium, copper, nickel, stainless steel, low-carbon steel, as well as with zinc, chromium and cadmium-plated parts. Problems which still need further investigation. 12 ref. (R general, T24)

132-R. Corrosion in Scotch Marine Boilers II. Model Boiler Tests on the Influence of the Copper Content of the Steel on the Corrosion of Tube in Artificial Sea Water. G. Butler and H. C. K. Ison. *Institute of Marine Engineers,* **Preprint, Feb. 1957, p. 13-20.**

Model boiler tests have been carried out to determine the influence of the copper content of steel on the corrosion resistance of mild steel boiler tubes in artificial sea water. Experiments with steels containing from less than 0.01% copper to 0.20% show that copper has some value in reducing the severity of pitting of tubes. 18 ref.
(R4b, 2-10; ST, *Cu,* 4-10)

133-R. (French.) **Selective Oxidation of Iron-Chromium Alloys in the Neighborhood of the Equilibrium of Dissociation of Cr_2O_3.** J. Moreau and J. Benard. *Journal de Chimie Physique et de Physico-Chimie Biologique,* v. 53, Oct. 1956, p. 787-797.

Nature of the oxidation and effect on the surface of the metal. 8 ref. (R1h; Fe, Cr)

134-R. (French.) **Study of Dry Rust in Copper-Manganese Alloys.** F. Bouillon and M. Jardinier. *Journal de Chimie Physique et de Physico-Chimie Biologique,* v. 53, Oct. 1956, p. 817-822.

Dry rust in copper-manganese alloys of 1.5%, 4.31% and 7.36% manganese composition; microscopic examination of samples. Presence of manganese serves to retard the rate of oxidation. 11 ref.
(R1h; Cu, *Mn*)

135-R. (German.) **Corrosive Properties and Passivation of Titanium and Its Alloys.** Ulrich Zwicker. *Chemie-Ingenieur-Technik,* v. 29, Feb. 1957, p. 107-109. (CMA)

It is known that mixtures of hydrochloric and nitric acid generate corrosion resistant films on the surface of titanium and its alloys. A closer study of this phenomenon was made by observing the corrosive behavior of pure titanium, of commercial titanium containing considerable iron, and of the ternary alloys titanium-chromium-aluminum and titanium-aluminum-vanadium in the presence of 20% hydrochloric acid alone or in mixtures with various amounts of nitric acid. In view of the differences in the composition of the materials examined, the differences observed are rather complicated, some alloys being less resistant than pure titanium while others are more resistant. In most cases the addition of 1.3% nitric acid to hydrochloric acid produced the strongest passivation effects.
(R10c, R6g; Ti)

136-R. Corrosion and Other Aspects Relative to the Use of Diphenyl as a Coolant-Moderator. Gustave C. Milak. Argonne National Laboratory. *U.S. Atomic Energy Commission,* ANL-5587, Nov. 1956, 43 p.

In over 4500 hr. of testing in static diphenyl at 500, 680 and 750° F., uranium and high-uranium alloys showed considerably lower corrosion rates and no tendency toward catastrophic failure by comparison with their counterparts in high-temperature water. Corrosion of structural and cladding materials was, in general, equivalent to that of stainless steel in water. Diphenyl showed much better lubricating qualities than water. (R4a, 2-12, T11; U)

137-R. Statistical Analysis of the Corrosion of Uranium—Part I. Tests in Moist Helium and the Effects of Impurities. James T. Waber. Los Alamos Scientific Laboratory. *U.S.*

Atomic Energy Commission, LA-1355, Jan. 31, 1952, 23 p.

Corrosion data from seven duplicate runs analyzed statistically and the slope and rate constant calculated for each run. Carbon appears to have the greatest effect on the slope. (R11a; S12, 3-19; U)

138-R. Stress Corrosion Cracking in Type 403 Stainless Steel. M. G. Fontana. Ohio State University Research Foundation (Wright Air Development Center). *U.S. Office of Technical Services,* PB 121414, Aug. 1956, 59 p. $1.50.

Mechanism of cracking due to stress-corrosion, which reportedly has caused fatigue failures in compressor blades of jet engines, is studied in tests of stainless steel alloys type 403, 420 and 431. The effects of austenitizing temperatures on hardness, impact strength, and microstructure were determined. Except for variations noted in the tempering temperature above which stress-corrosion cracking susceptibility was lost, all data indicated that the mechanism of stress-corrosion is the same for the three steels. (R1d; SS)

139-R. (Book.) **Stress Corrosion Cracking and Embrittlement.** William D. Robertson. 202 p. 1956. John Wiley and Sons, Inc., 440 Fourth Ave., New York 16, N. Y. $7.50.

Eighteen authorities give extensive experimental and theoretical consideration to the significance of stress-corrosion cracking phenomena, with respect to stability and safety of structures. (R1d)

140-R. Dissolution of the Oxide Film on Zirconium. R. D. Misch. *Acta Metallurgica,* v. 5, Mar. 1957, p. 179-180. (CMA)

The rate of dissolution of the oxide film on zirconium when heated in vacuum was measured by comparing colors of anodic films before and after heating. Color changes were uniform and could be estimated to 90° A.; a uniform reduction at the metal:oxide interface is indicated. A graph shows that the rate of film dissolution varies linearly with tempearture over the range from 425 to 625° C. (R2r, 1-23; Zr)

141-R. Corrosion Problems in Chemical Factories—I. Choice of Construction Materials. F. R. Himsworth and J. G. Hines. *Chemical Age,* v. 77, Feb. 1957, p. 285-289.

Current practice in corrosion prevention. (R general, T28, 17-7)

142-R. Corrosion of Steel Pipe by Savannah River Water. F. Welty. E. I. du Pont de Nemours and Co. *U.S. Atomic Energy Commission,* D-170, Aug. 1956, 15 p.

Test sections of carbon steel pipe were pitted to a maximum depth of 0.06 in. during 30 months exposure to flow of raw river water. The rate of pitting penetration of new pipe decreased with time during the first year of exposure and thereafter leveled off at approximately 0.01 in. per year. (R4a; ST, 4-10)

143-R. Corrosion and Mass Transfer by Lithium at Elevated Temperatures. E. E. Hoffman and L. R. Trotter. "Metallurgy Information Meeting, Ames Laboratory", *U.S. Atomic Energy Commission,* TID-7526 (Pt. 1), Feb. 1957, p. 244-249.

Application of lithium metal as a heat transfer medium, especially as a nuclear reactor coolant. The major problem encountered, and one which is yet to be resolved, is the inability of commercially available metals and alloys to withstand the corrosive effect of lithium in dynamic systems at temperatures in excess of 1000° F. General review of the results of static, isothermal tests; recent results on 17 thermal convection loop tests conducted on iron and nickel-base alloys. (R6m, 2-12, T11p; Li, Fe, Ni)

144-R. (German.) **Investigations of the Reaction Between Aluminum and Water.** D. Altenpohl. *Aluminium,* v. 33, Feb. 1957, p. 78-91.

The effect of repeated use of high-purity water, the influence of various small additions (e.g., silica, sulphuric acid, citric acid, boric and carbonic acids) thereto; influence of its pH and the suitability of layers formed in alkaline solution for corrosion protection. 11 ref. (R4, 1-2; Al)

145-R. (German.) **Behavior of Some Aluminum Alloys in Mixtures of Chromic and Phosphoric Acids.** K. M. Carlsen. *Aluminium,* v. 33, Feb. 1957, p. 101-103.

Hot 4% chromic anhydride and 10% phosphoric acid used, in the removal of corrosion from aluminum, itself attacks aluminum and aluminum alloys under normal conditions. 2 ref. (R6g; Al)

146-R. (Swedish.) **Stress-Corrosion in Aluminium Alloys.** *Teknisk Tidskrift,* v. 86, Nov. 13, 1956, p. 983-985.

Causes, detection and mechanism of stress-corrosion. The best protection is plating with pure aluminum. (R1d; Al)

147-R. New Data on Stress-Corrosion Cracking of Brass. *ASTM Bulletin,* No. 220, Feb. 1957, p. 37.

Study of the relationship between crystal orientation and stress-corrosion cracking in alpha and beta brasses. Results indicate crystal orientation has an important influence on galvanic action which produces cracking. (R1d; Cu-n)

148-R. Variations in the Structure Across the Thickness of the Scale on Nickel Steels. K. Sachs. *Iron and Steel Institute Journal,* v. 185, Mar. 1957, p. 348-357.

The inner layers of the scales formed by various treatments on specimens of nickel steel were examined by a number of different methods. It was found that both the amount of metal in the scale and the over-all nickel content pass through a maximum at some distance from the metal core; no nickel was found outside the dimensions of the original specimens, except in one case. The scale near the core consists of wüstite and metal enriched in nickel. 13 ref.
(R2q, M27; AY, *Ni*)

149-R. Measurement of the Corrosion Rate of Iron by Polarization Techniques. W. J. Schwerdtfeger. *Journal of Research of the National Bureau of Standards,* v. 58, Mar. 1957, p. 145-153.

Corrosion-rate measurements can be made automatically by using a synchronously driven voltage divider and a two-pen electronic recorder. The polarizing characteristics of high-silicon cast iron when exposed to a 2,000-ppm. sodium chloride solution were also studied. It is shown that the corrosion rate becomes relatively low as the corrosion reaction changes from cathodic to anodic control. 8 ref. (R11m; Fe)

150-R. Influence of Crystallographic Orientation on the Corrosion Rate of Aluminum in Acids and Alkalies. Theodore H. Orem. *Journal of Research of the National Bureau of Standards,* v. 58, Mar. 1957, p. 157-167.

The corrosion of single crystals of high-purity aluminum in strong acid and alkali media is disclosed as an orderly process, the rate of attack being dependent on the orientation of the corroding surface; observations of the corrosion by acid and alkali solutions of disks with central holes, and rectangular prisms, both of monocrystalline aluminum, result in interesting conclusions and comparisons with respect to the corrosion process. 15 ref.
(R6g, R6j, 3-22; Al)

151-R. Current Views on How Paint Films Prevent Corrosion. J. E. O. Mayne. *Oil and Colour Chemists' Association, Journal,* v. 40, Mar. 1957, p. 183-199.

Mechanism of the corrosion of iron and steel and the arguments which led to the conclusion that protection is associated with a high electrical resistance; the effect of ions on this resistance is considered. The ions may be underneath the paint film and consequently short-circuit the high resistance, or they may occur outside the film and bring about a decrease in resistance by diffusing into the film. (R1; 8-20)

152-R. (German.) **Corrosion of Soft Steel in Alkali Mono and Alkali Hydrogen Fluorides. 1. Influence of the Concentration of the Solution Upon the Corrosion of Soft Steel.** W. Köhler. *Werkstoffe und Korrosion,* v. 8, Mar. 1957, p. 133-138.

Corrosion depends on concentration of the solution. In potassium fluoride and potassium fluoride-hydrogen fluoride solutions corrosion resistant coatings are formed, while in ammonium fluoride-hydrogen fluoride solutions corrosion appears even at relatively high concentrations. 16 ref. (R6j; CN)

153-R. (German.) **On the Behavior of Brass in Dilute Solutions of Mineral Acids and Their Mixtures in the Presence as Well as in the Absence of Inhibitors.** W. Machu and M. G. Fouad. *Werkstoffe und Korrosion,* v. 8, Mar. 1957, p. 139-145.

Loss of weight of 60-40 brass in mineral acids or their mixtures, with and without inhibitors, is not additive and does not depend on the accelerating or inhibiting effects of the inhibitors, but on the more or less favorable conditions which prevail for the formation of protective coatings. 15 ref.
(R6g, R10b; Cu-n)

154-R. (Spanish.) **Tests on Susceptibility to Intercrystalline Corrosion in 18-8 Stainless Steels.** Francisco Joanxich Ayma. From "Papers Presented at 28th International Congress of Industrial Chemistry", 1956, 5 p.

Standard A.S.T.M. tests and metallographic tests performed on four specimens of steel (one of Spanish origin and three foreign); results compared. Metallographic tests were accurate; their brevity makes them highly practical. 21 ref. (R11a, 15-18)

155-R. (Book.) **Corrosion: A Compilation.** Mars G. Fontana. 280 p. 1957. Press of Hollenback, Columbus, Ohio.

Practically all metals and alloys and some nonmetallics used for corrosion applications are covered. Methods and detailed procedures for laboratory and plant testing. Isocorrosion charts, which show corrosion as a function of temperature and concentration of acids. Causes and cures for many actual plant problems. Mechanisms of corrosion are described in readily understandable terms. (R general)

156-R. Preventation of Corrosion in Packing and Storage. E. L. I. Evans and E. G. Stroud. *Chemistry and Industry,* no. 9, Mar. 2, 1957, p. 242-248.

Preventing corrosion of metals in storage and transit; controlling factors in atmospheric corrosion such as metal-gas reaction, metal-liquid reaction and the corrosion product and solid contaminant. 29 ref. (R10e, R3)

157-R. Cathodic Protection of the Coated Steel. Gas Main Distribution System in New Orleans. Sidney E. Trouard. *Corrosion,* v. 13, Mar. 1957, p. 21-31.

Includes information on topography and soils, pipes of gas mains, use of coatings, galvanic anodes, rectifiers, ground beds and insulated joints. Satisfactory protection secured. (R10d, R8; ST, 4-10)

158-R. Corrosion Control System for Underground Cables in Conduit in a Stray Current Metropolitan Area. Edward P. Teale. *Corrosion,* v. 13, Mar. 1957, p. 35-42.

Investigation indicated the single drainage wire no longer gives adequate protection due to subsurface conditions. Problems overcome by use of controlled rectifier employing two stages of magnetic amplification maintaining current drainage at minimum value required by potential difference between cable and earth. (R8, R10d, T7)

159-R. Corrosion of Steel in a Reinforced Concrete Bridge. R. F. Stratfull. *Corrosion,* v. 13, Mar. 1957, p. 43-48.

Studies of bridge exposed to salt water environment showed high permeability of concrete with low effectiveness in restricting moisture and air from steel, resulting in macrogalvanic corrosion. Resistivity measurements of concrete indicated anodic areas probably were created by larger moisture or sea salt content. (R4b, T26p; ST)

160-R. Evaluation of Cooling Tower Corrosion Inhibitors. W. L. Denman and Charles B. Friedman. *Corrosion,* v. 13, Mar. 1957, p. 49-55.

Experiments with chromate and polyphosphate inhibitors using steel test coupons demonstrated effectiveness of small pilot tower in the evaluation of corrosion inhibitors for cooling water. (R10b, R4; ST)

161-R. Polyvinylidene Chloride Film and Microcrystalline Wax for Protecting Underground Pipe. Ted Kennedy, Jr. *Corrosion,* v. 13, Mar. 1957, p. 56-60.

Case histories indicate effectiveness of wax and film protection in preventing corrosion. (R8, L26q; 4-10)

162-R. Testing of Coal Tar Coatings. Pt. II. Field Exposure in Cold Climates. W. F. Fair, C. U. Pittman and M. G. Sturrock. *Corrosion,* v. 13, Mar. 1957, p. 61-64.

Details of an experiment are given in which 10-ft. lengths of pipe were buried in Canada at depths of 1 through 5 ft. after application of five systems of coatings and wrappings on groups of five pipes each. Pipes were buried after testing with an electronic holiday detector with self-registering thermometers in two pipes at each level. After a year's exposure the pipes were unearthed and tested electrically for holidays. (R8, L26a; 4-10)

163-R. Effect of Ultraviolet Irradiation on the Growth of Anodic Ta_2O_5 Films. D. A. Vermilyea. *Electrochemical Society Journal,* v. 104, Apr. 1957, p. 212-217.

Ultraviolet irradiation during the growth of amorphous tantalum oxide films in aqueous solutions results in the transformation of the outer portion of the film from tantalum oxide to a material which dissolves more rapidly than tantalum oxide in hydrogen fluoride. If the formation field is high, the transformed region has a very high resistance and both tantalum and oxygen are mobile in the region. When the formation field is low, the region

has a lower resistance, contains water which can be removed partially by heating the film in air, and only oxygen is mobile. (R1h; Ta)

164-R. Oxidation of 50 Weight Per Cent Uranium-Zirconium Alloy. Sidney Barnartt, Robert G. Charles and Earl A. Gulbransen. *Electrochemical Society Journal,* v. 104, Apr. 1957, p. 218-221.

The reaction of 50% uranium-zirconium with oxygen at 1 atm. pressure was studied over the range 200-500° C. Two forms of the alloy, the stable epsilon phase and the quenched gamma phase, were reacted to an oxide-scale thickness of 0.1 mm. at the higher temperatures. In general, the weight gain increased linearly with time, although in many cases the oxidation curve showed a bend and could be represented by two straight lines. At 400° C. and above, the stable epsilon phase reacted considerably faster than the gamma phase. 14 ref. (R1h; U, Zr)

165-R. Coatings: Vital Part of Corrosion Prevention. *Gas,* v. 33, Mar. 1957, p. 50-54.

Brief discussion of corrosion phenomena and coating system. (R general, L general; 4-10)

166-R. Corrosion Mitigation in Congested Areas. F. E. Kulman. *Gas,* v. 33, Mar. 1957, p. 60-61.

Problems on stray currents, pipe materials, insulating joints and cathodic protection. (R10; 4-10)

167-R. Stress-Corrosion of Austenitic Stainless Steels in Chemical Plant Equipment. William C. Rion. *Industrial and Engineering Chemistry,* v. 49, Mar. 1957, p. 73A-78A.

Some case histories of condenser, heat exchanger and cooling coil failures, failures caused by contact of heated stainless steel with wet thermal insulation. (R1d, T29; SS)

168-R. Here's Why Underground Pipe Corrodes. *Oil and Gas Journal,* v. 55, Mar. 11, 1957, p. 133-135.

Simple explanation of the galvanic corrosion of pipe. (R8)

169-R. Resistance of Titanium to Sulfuric and Hydrochloric Acids Inhibited by Ferric and Cupric Ions. J. R. Cobb and H. H. Uhlig. Massachusetts Institute of Technology. Technical Report 6 Under Contract N5 Ori-07815. *U.S. Office of Technical Services,* PB 123144, June 1951, 10 p. (CMA)

Ferric and cupric ions inhibit titanium corrosion in boiling media such as 10% hydrochloric or 10% sulphuric acid. Amounts of 0.005 mole per liter are effective, lowering the corrosion rate to 0.012 in. per year. The consumption of inhibitor with corrosion is moderate, especially at higher concentrations. The main mechanism of inhibition seems to be surface adsorption of the ions. (R6g, R10b; Ti)

170-R. (French.) **Induced Formation of Epitatic Oxide Films on Alpha Uranium by Atmospheric Oxidation and Anodic Oxidation.** A. Robillard and P. Lacombe. *Journal de Chimie Physique et de Physico-Chimie Biologique,* v. 53, Oct. 1956, p. 798-802.

Microscopic view of relative orientation of crystals; bands of deformation; kinetics of oxidation and function of the crystalline orientation; structure of alpha uranium; defines the conditions for the preparation of uranium surfaces which permit the formation of epitatic oxide films. 9 ref. (R1h, M26; U)

171-R. (Russian.) **Influence of Asymmetrical Loading Upon the Corrosion Fatigue Resistance of Pumping Rods.** R. M. Raskin and R. A. Bagramov. *Vestnik Mashinostroeniia,* v. 37, no. 1, Jan. 1957, p. 28-30.

Experiments show that during corrosion fatigue, the over-all amplitude of steel 40 U pumping rods remains constant with an increase of asymmetry. With increasing asymmetry of the cycle, the relative lowering of corrosion-fatigue resistance diminishes. 3 ref. (R1e; ST)

172-R. Corrosion Prevention of Railroad Equipment. J. W. Crossett. *American Society of Mechanical Engineers, Preprint,* no. 57-RR-1, Apr. 1957, 6 p.

Some of the problems contributing to corrosion loss on diesel electric locomotives, passenger equipment and freight cars: remedies to minimize these losses. (R general, T23)

173-R. Oxidation of 50 Weight Per Cent Uranium-Zirconium. S. Barnartt, R. G. Charles and E. A. Gulbransen. *Electrochemical Society Journal,* v. 104, Apr. 1957, p. 218-221. (CMA)

Oxidation at 1 atm. was studied in the range 200-500° C. for both the stable epsilon-phase and the quenched gamma-phase. Weight gain increased linearly with time for the greater part of the curve. The epsilon-phase reacts faster than the gamma-phase above 400° C. The

thick scales were porous and enriched in uranium. The rate law was parabolic in the 200-250° C. range for thin oxide films. Oxidation is faster than with pure zirconium. 14 ref. (R1h; Zr, U)

174-R. Oxidation of Zirconium Between 400 and 800° C. E. A. Gulbransen and K. F. Andrew. *Journal of Metals,* v. 9, no. 4, Apr. 1957, p. 394-400. (CMA)

Abraded and chemically polished zirconium samples were subjected to oxidation in the range 400-800° C.; the vacuum microbalance was used. The cubic rate law fits the data on abraded samples best; however, disregarding an initial deviation permits application of the parabolic law, which is also applicable to the chemically polished samples. The activation energies above and below 525° C. are 28,600 and 18,200 cal. per mole, respectively. Data fit in with analyses of higher and lower ranges. Entropies of vacancy formation and vibration frequencies of zirconium dioxide bonds are indicated. (R2h, P12s; Zr)

175-R. Temporary Rust Preventives. Edgar S. Lower and S. C. Cressey. *Machinery,* v. 90, Mar. 8, 1957, p. 537-540.

Majority formulated on basis of lanolin; types of films, pretreatment of surfaces, application of preventive, wrapping of treated parts and removal of preventive. (R10f)

176-R. Statistical Analysis of the Corrosion of Uranium. Pt. 1. Tests in Moist Helium and the Effects of Impurities. James T. Waber. Los Alamos Scientific Laboratory. *U.S. Atomic Energy Commission,* LA-1355, Jan. 31, 1952, 23 p.

Rate data concerning the corrosion of uranium have been treated statistically. A partial analysis of the effect of impurities has been made. The methods and equations are briefly explained. (R11, 3-19; U)

177-R. High-Temperature Oxidation and Contamination of Niobium. William D. Klopp, Chester T. Sims and Robert I. Jaffee. Battelle Memorial Institute. *U.S. Atomic Energy Commission,* BMI-1170, Feb. 19, 1957, 22 p.

The oxidation and contamination rates of columbium in oxygen and in air were measured in the temperature range 600 to 1200° C. The oxidation curves in oxygen were linear and the rate constants were correlated by an Arrhenius-type plot. 13 ref. (R2h; Cb)

178-R. Climatic Extremes for Military Equipment. N. Sissenwine and A. Court. Office of the Quartermaster General, Department of the Army. *U.S. Office of Technical Services,* PB 121741, Nov. 1951, 70 p. $1.75.

Environmental stresses studied were thermal, humidity, precipitation, wind, penetration and abrasion, salt spray and atmospheric pressure. Probable and practical extremes were determined for each. Conditions were established for design and evaluation of military equipment for use under world-wide, hot desert, arctic winter, and moist tropical climatic extremes. (R3, T2)

179-R. (German.) **Corrosion Resistance of High-Purity Aluminum.** E. Nachtigall. *Aluminium,* v. 33, Feb. 1957, p. 95-100.

Corrosion of high-purity aluminum occurring at temperatures over 100° C., and at high pressure (conditions existing in nuclear reactors) is intergranular. It decreases as the degree of hardness (produced by cold working) increases, and it is also relatively low in cast metal. This corrosion cannot be prevented by chemical or anodic surface conditioning, but it can be inhibited by the addition of a mixture of alkaline chromate and alkaline silicate to the water. (R4a, R10b; Al-a)

180-R. Corrosion Mechanisms in the Plain Can. E. L. Koehler and C. M. Canonico. *Corrosion,* v. 13, Apr. 1957, p. 19-29.

Study of the various factors and mechanisms involved in the corrosion of plain tin-coated steel cans containing peaches or prune juice. Include such items as amount of hydrogen evolved, amount of tin and steel dissolved, potential relationships, protective currents and polarization characteristics of coupled tin and steel. (R7n, R1a; CN, *Sn,* 8-15)

181-R. Corrosion Measurements in a Hydrogen Sulfide-Water Absorption Pilot Plant. B. W. Bradley and N. R. Dunne. *Corrosion,* v. 13, Apr. 1957, p. 30-34.

Tabulates corrosion rates for carbon steel and effect of amine type inhibitor on rate. Killed carbon steel, Stainless Type 304, Inconel, "K" Monel and other alloys were evaluated as to corrosion rate, sulphide stress cracking resistance and

performance with corrosion inhibitor present. (R10b; CN, SS, Ni)

182-R. Effect of Dissolved Oxygen on Corrosion of Steel and on Current Required for Cathodic Protection. E. Schaschl and G. A. Marsh. *Corrosion,* v. 13, Apr. 1957, p. 35-43.

Study of interrelationship of corrosion rate of steel, dissolved oxygen concentration, agitation, electrode potential, cathodic protection, current density. Suggests that corrosion proceeds by chunk removal of metal at low pH and discusses importance of differential aeration in corrosion of buried structure. 26 ref. (R10d; ST)

183-R. Case History in Cooling Water Treatment. C. J. Holland, Jr., and W. A. Tanzola. *Corrosion,* v. 13, Apr. 1957, p. 49-54.

History and problems in preventing deterioration and corrosion by the use of controlled pH and phosphate and chromate inhibitors. (R10b)

184-R. Special N-80 Steel Tubing Developed in France to Resist Sulfide Stress Corrosion in Sour Gas Wells. L. Cauchois, J. Didier and E. Herzog. *Corrosion,* v. 13, Apr. 1957, p. 55-61.

Data from mechanical property and corrosion tests and use as tubing at corrosion gas wells indicated strength and stress-corrosion resistance of APS 10 M4; a chromium-aluminum-molybenum alloy steel. (R1d, R7a; AY, 4-10)

185-R. Effect of Variables in Laboratory Testing of Corrosion Inhibitors for Refined Petreloum Products. David B. Boies and J. I. Bergman. *Corrosion,* v. 13, Apr. 1957, p. 69-74.

Variables studied to determine the effect of inhibitor performance include degree of agitation, concentration of dissolved solids in water phase, the pH, temperature, oxygen content and nature of hydrocarbon phase. (R10b, R11)

186-R. Fly Ash Prevents Corrosion. W. C. Thompson. *Electrical World,* Apr. 15, 1957, p. 84.

Iron pipe buried in soil is protected against corrosion when it is embedded in fly ash. An analysis of the fly ash is given. (R10a)

187-R. Causes of Corrosion and Prevention With Pipe Wrap. Laurence P. Benedict. *Gas Age,* Apr. 4, 1957, p. 40-41.

Two most common causes are galvanic and stray current. Method for protection using polyvinyl chloride tape as wrapping. (R10b, R1a)

188-R. Cathodic Protection in Pulp and Paper Mills. Joseph A. Lehman. *Paper Trade Journal,* Apr. 15, 1957, p. 64-68.

Cathodic protection and its application to the paper industry. (R10d, T29r)

189-R. Preventing Corrosion by Crude. Use of Surface-Active Agents. D. Bass. *Petroleum,* v. 20, Apr. 1957, p. 139-142.

The petroleum engineer now has a wide range of chemical inhibitors at his disposal for use in combating corrosion. Of these, the organic inhibitors derived from natural fats are finding wide application. Discussion of the use of cationic surface-active agents to combat corrosion due to crude oil both at the oil well, with particular reference to water injection techniques and at the refinery. (R7a, R10b)

190-R. Logarithmic Transformations in the Analysis of Corrosion Data. H. C. Bowen, C. Groot and J. L. Leach. Hanford Atomic Products Operation, Richland, Wash. *U.S. Atomic Energy Commission,* HW-48753, Feb. 18, 1957, 10 p.

Logarithmic transformation of corrosion data can give constant variance and additive effects and turn a hopelessly complex system into a simple one. (R11, S12j)

191-R. Oxidation of Titanium and Titanium Alloys. D. W. Stough, F. W. Fink and R. S. Peoples. Battelle Memorial Institute. Report 29. *U.S. Office of Technical Services,* PB 124566, Jan. 1956, 68 p. (CMA)

Scaling behavior in pure oxygen of titanium and its alloys depends on a different rate law for each of the ranges 80-570° F., 570-1000° F. and 1100-1800° F. The oxidation rate increases with temperatures and becomes important in the 1100-1800° F. range. The alloys with iron, chromium, manganese or vanadium scale faster than pure titanium. (R1h, R2q, 2-11, 2-10; Ti)

192-R. (English.) **Corrosion of Lead Sheath in Manhole Water.** *Nippon Telegraph and Telephone Public Corp., Electrical Communication Laboratory, Reports,* v. 4, Nov. 19, 1956, p. 5-10.

Results of field tests and recommendations for corrosion prevention. (R4f; Pb)

193-R. (French.) **Topochemical Study of Corrosive Phenomena.** W. Feitknecht. *Corrosion et Anticorrosion,* v. 5, Feb. 1957, p. 36-50.

Electrochemical, thermodynamic and topochemical aspects of corrosion. Method of topochemical examination which permits analysis of complex corrosive phenomena by the study of solid corrosive products which play an essential role in the development of corrosion. Use of the electronic microscope and diffraction of X-rays for the identification and specification of the texture of weak corrosion products and superficial films. 25 ref. (R11a, 1-3)

194-R. (French.) **Study of the Evolution of Characteristics of Sea Water in a Corrosion Testing Station.** L. Barriety, J. Debyser and A. Hache. *Corrosion et Anticorrosion,* v. 5, Feb. 1957, p. 51-57.

Endeavor to determine the influence of the phenomenon of photosynthesis on the corrosive activity of steel by sea water. Analyzes the influence of temperature, pH and oxygen content of sea water. 7 ref. (R4b, R11)

195-R. (French.) **Work on Corrosion Undertaken by the British Iron and Steel Research Association.** J. C. Hudson. *Corrosion et Anticorrosion,* v. 5, Mar. 1957, p. 69-75.

Summary of almost 30 years' research activity, covering atmospheric corrosion, influence of climate, corrosion in sea water and potable water, and corrosion in the ground. (To be continued.) (R general, A9)

196-R. (French.) **Concerning the Mechanism of Intercrystalline Corrosion of Soft Steel by Ammonium Nitrate.** M. Smialowski and T. Ostrowska. *Corrosion et Anticorrosion,* v. 5, Mar. 1957, p. 76-81.

Samples of iron with small and large crystals were submitted under tension to the action of ammonium nitrate solutions. Verifies that monocrystal samples reveal a stronger cathodic polarization than polycrystalline samples, and that the grains show great differences in their cathodic polarization capacity, as a function of their crystallographic orientation. 10 ref. (R2h, R6j, 3-21; CN)

197-R. (German.) **Corrosion Resistant Alloys.** Ernst Brunhuber. *Giesserei-Praxis,* v. 75, Mar. 10, 1957, p. 105-108.

Tabulation of corrosion resistant alloys and corresponding corroding agents. (R general; SGA-g)

198-R. (German.) **Electrochemical Corrosion of Nonferrous Alloys.** H. Vosskühler. *Metall,* v. 11, Mar. 1957, p. 193-196.

Electrochemical corrosion possible only when intercrystalline and transcrystalline fracture surface is anodic to the rest of the crystal surface. Explanation of the corrosion mechanism. 16 ref. (R1; EG-a)

199-R. (German.) **Effect of Inhibitors and Wetting Agents on the Corrosion of Iron in Dilute Sulphuric Acid.** W. Machu and Solomon El Gendi. *Metalloberfläche,* v. 11, Apr. 1957, p. 135-139.

Use of aryl-alkyl derivatives of dodecylsulphonates in dilute sulphuric acid. Action of inhibitors can be positively or negatively influenced by wetting agents. 9 ref. (R6g, R10b; Fe)

200-R. (German.) **Oxidation of Germanium.** Oscar Rösner. *Zeitschrift für Metallkunde,* v. 48, Mar. 1957, p. 137-141.

Single crystals of germanium are less oxidized than polycrystals of equal purity and the oxidizability of germanium decreased with increasing purity in various agents such as water, air, carbon dioxide, etc. 7 ref. (R1h; Ge)

201-R. (Book—German.) **Corrosion and Wear of Steels and Their Control in Steam Generating Plants and in Machine and Vehicle Construction.** G. W. Akimow. 160 p. 1956. VEB Verlag Technik, Unter den Linden 12 (Russian Sector), Berlin NW 7, Germany.

Protection of steel from corrosion fatigue; investigations in the field of intercrystalline stress-corrosion of boiler steels; investigation of corrosion resistance of boiler steels against high-temperature steam; testing of inhibitors against jamming of detachable machine parts at high temperatures; effect of the surface machining on the corrosion resistance of steel; investigation of the influence of different procedures of surface machining on the corrosion tendency of steel by plotting of polarization curves; repair of automotive parts by chromium plating. (R4d; ST)

202-R. Stress Corrosion Cracking of Titanium Weldments. W. L. Arter and R. Meredith. *Automotive Industries,* v. 116, May 1, 1957, p. 106. (CMA)

In testing a welded tank of A-110AT, numerous weld cracks developed from internal pressure at 700° F. The tank was filled with a chlorinated hydrocarbon. Further study showed that the hydrocarbon caused stress-corrosion cracks at 700° F. which tend to follow the direction of rolling. (R1d; Ti, 7-1)

203-R. Titanium Corrosion and Inhibition in Fuming Nitric Acid. H. B. Bomberger. *Corrosion,* v. 13, May 1957, p. 17-21. (CMA)

Titanium corrodes rapidly and a pyrophoric deposit forms in red fuming nitric acid when there is no access to air. Adding air or anhydrous copper sulphate reduces corrosion markedly. Such attack is intergranular and beta-phase is removed preferentially in a two-phase alloy, leaving pyrophoric alpha. Adding 1.5% H_2O increased the corrosion rate but staining, cracking or pyrophoricity was not evident. Inhibition of corrosion is believed to be due to an adsorbed layer of ions on the titanium. (R6g, R10b; Ti)

204-R. Effect of Pre-Oxidation in Oxygen on the Steam Corrosion Behavior of Zircaloy-2. D. E. Thomas and S. Kass. *Electrochemical Society, Journal,* v. 104, May 1957, p. 261-263. (CMA)

Exposing Zircaloy-2 to dry oxygen had no effect on corrosion behavior, as the kinetics remained the same. Corrosion product hydrogen from steam is therefore not implicated. Zirconium exposed to dry oxygen shows neither spalling nor the rate transition from quasi-cubic to linear as is normal. Breakaway occurs with zirconium regardless of pre-oxidation, and thus hydrogen pickup is implicated. Alloying additions prevent breakaway but promote the rate transition. (R4d; Zr)

205-R. Aqueous Corrosion of Uranium Fuel-Element Cores Containing 0 to 20 w/o Zirconium. D. R. Greiser and E. M. Simons. *U.S. Atomic Energy Commission,* BMI-1156, Jan. 7, 1957, 29 p. (CMA)

A device used to test the aqueous corrosion of uranium fuel cores with up to 20 % Zr is described. Time-lapse movies of the swelling and rupture were taken of deliberately defected zirconium-clad samples. Corrosion rates were calculated from temperature and pressure measurements. (R4, 1-3, T11g, 17-7; U, *Mo*)

206-R. Corrosion Properties of Zirconium-Base Fuel Alloys. S. Kass. *U.S. Atomic Energy Commission,* WAPD-136, Nov. 2, 1957, 41 p. (CMA)

Zirconium-base alloys were studied in 680° F. water and in steam at 750° F. and 1500 psi. The corrosion of Zr alloys with 4 to 15% U follows a course of initial formation of an oxide film, film breakdown and general spalling. The corrosion resistance decreases with higher contents of uranium, but tin improves the corrosion resistance of the alloys. Using Zircaloy-2 instead of zirconium gave no improvement. Adding up to 1% Fe had bad effects on the corrosion properties of Zr-U-Sn alloys. The 4% U, 8% Cb alloy shows promise as a corrosion resistant fuel alloy. (R4, 1-10, T11g, 17-7; Zr)

207-R. Corrosion in Distilling and Vacuum-Distilling Plants for the Processing of Middle East Crude Oils. W. A. Derungs. *American Petroleum Institute, Proceedings,* v. 36 (III), 1956, p. 49-54.

Mild steel can be used extensively in atmospheric and vacuum-distillation units, provided that the maximum operating temperature is restricted to 300 to 330° C.; that 3% by weight of aqueous caustic soda mixed with cold crude oil is injected into the feed line between heat exchangers and furnace; and that 3% by weight of aqueous ammonia is injected into the overhead line. (R7a; CN)

208-R. High-Temperature Hydrogen-Sulfide Corrosion in Commercial Sovaformer Units. E. B. Backensto, R. D. Drew and J. N. Vlachos. *American Petroleum Institute, Proceedings,* v. 36 (III), 1956, p. 55-67.

Corrosion test results obtained in two commercial Sovaformers (static-bed reformers utilizing a platinum-type catalyst) are presented for a wide variety of commonly used steels. Summary curves are presented which relate temperature and concentration of hydrogen sulphide to corrosion rates for 0 to 5% chromium steels and for chromium-nickel austenitic steels. (R7k, R11; SS)

209-R. How Richfield Plans to Combat High-Temperature Sulfide Corrosion in Its New Catalytic Reformer. R. W. Neumaier and C. M.

Schillmoller. *American Petroleum Institute, Proceedings,* v. 36 (III), 1956, p. 68-77.

Anticipated maximum corrosion rates have been plotted for different hydrogen sulphide concentrations. The importance of applying corrosion control in the design stage of the unit is stressed.
(R7k, T29n, 17-7)

210-R. Stress-Corrosion of Wrought Ternary and Complex Alloys of the Aluminum-Zinc-Magnesium System. R. Chadwick, N. B. Muir and H. B. Grainger. *Institute of Metals, Journal,* v. 85, Jan. 1957, p. 161-170.

Equipment employing spring loading combined with a dash-pot device to absorb energy released by the breaking of a stressed specimen was used to establish stress vs. time-to-failure relationships. Wrought ternary alloys with 5-9% zinc and 0.4-2.8% magnesium, and complex alloys with 7% zinc and 2¼% magnesium with smaller amounts of copper, manganese and chromium were studied.
(R1d, 1-3; Al, *Zn, Mg*)

211-R. How-To's on Reducing Corrosion. Larry Resen. *Oil and Gas Journal,* v. 55, Apr. 2, 1957, p. 116-117.

Suggestions for control of corrosion in an alkylation unit include: use of plastic linings and inhibitors, and positive control of caustic strength and circulation.
(R6j, R10)

212-R. How to Stop Corrosion Under Insulation. H. M. Wilten. *Petroleum Refiner,* v. 36, Apr. 1957, p. 192-193.

Brief discussion on specification or insulating piping and equipment; preparation of surfaces, material and application. (R10; 4-10)

213-R. Approaching Problems of Cooling Water Corrosion. M. C. Forbes. *Petroleum Refiner,* v. 36, Apr. 1957, p. 164-165, 216.

Only two variables are really important; effect of conductivity and effect of inhibitor on anodic and cathodic areas. (R4a, R10b)

214-R. Investigation of Scaling of Zirconium at Elevated Temperatures. Quarterly Status Report No. 15 for Dec. 2, 1956 to Mar. 2, 1957. H. B. Probst, E. B. Evans and W. M. Baldwin, Jr. *U.S. Atomic Energy Commission,* AECU-3424, Mar. 6, 1957, 7 p. (CMA)

Instantaneous scaling rates were determined to show the effects of oxygen and nitrogen on the scaling behavior of zirconium at 800° C. Scaling runs in air after prescaling with nitrogen show a rise and an abrupt drop in rate below the point for that in air only. Scale growth and breakaway time are also less. The gas absorbed in the metal is confined to the outer layers, the depth depending on time, temperature and atmosphere. The temperature of greatest absorption is 900° C. (R2q, 2-12; Zr)

215-R. Corrosion of Uranium-Zirconium Alloys in Water at Temperatures up to 100° C. H. A. Pray and W. E. Berry. *U.S. Atomic Energy Commission,* BMI-893, Dec. 16, 1953, 26 p. (CMA)

Uranium with 5% Zr shows good corrosion resistance in water at 100° C. after exposure for one year if it is oil or water quenched from above 700° C. Subsequent annealing at 500 or 600° C. decreases the resistance, as do dissolved hydrogen-oxygen mixtures above 35:1. A nitric acid pickle overcomes the effects of abrasion damage and does not harm the corrosion resistance, nor does galvanic coupling with aluminum have a bad effect. Increasing zirconium beyond 7.5% eliminates the sensitivity to crevice effects and the dissolved hydrogen-oxygen ratio. (R4; U, *Zr*)

216-R. Corrosion and Ignition of Titanium Alloys in Fuming Nitric Acid. J. B. Rittenhouse, et al. Wright Air Development Center, Technical Report 56-414. *U.S. Office of Technical Services,* PB 121940, Feb. 1957, 67 p. (CMA)

Corrosion studies of titanium alloys stored in fuming HNO_3 covered ignition reactions and stress-corrosion cracking. The conditions of the HNO_3-NO_2-H_2O system varied from 1 hr. to 90 days, 25 to 71° C., and liquid to vapor phase. Results of metallographic examinations of corroded samples are discussed and X-ray diffraction data reported.
(R6g; Ti)

217-R. (English.) **Kinetics of the Oxidation of Silicon Iron in Air at High Temperatures.** V. V. Ipatyev and G. M. Orlova. *Journal of Applied Chemistry of the USSR,* v. 29, June 1956, p. 881-888. (Translated by Consultants Bureau Inc., 227 W. 17th St., New York 11, N. Y.)

Composition and structure of the scale on iron determines in some cases the rate of iron oxidation in

various gaseous media (air, steam-hydrogen and steam-oxygen mixtures) at high temperatures. The influence of small additions of silicon to iron on the oxidation rate of the resulting alloy in air, and the effect of silicon on the composition and structure of the scale formed during oxidation. 7 ref.
(R1h, 1-12; Fe, *Si*)

218-R. (English.) **Oxidation of Chromium-Silicon Steels in Air at High Temperatures.** G. M. Orlova and V. V. Ipatyev. *Journal of Applied Chemistry of the USSR,* v. 29, June 1956, p. 889-897. (Translated by Consultants Bureau Inc., 227 W. 17th St., New York 11, N. Y.)

An investigation of the oxidation kinetics of 6% Cr steel containing 1.43, 1.86 and 3.34% Si in the temperature range 800-1200° C. Linear relation exists between log K (constant of reaction rate) and the reciprocal of the absolute temperature for all steels. 10 ref.
(R1h, 2-12; AY, *Cr,* Si)

219-R. (English.) **Method of Electrochemical Oxide Coating of Iron and Steel in Hot Concentrated Alkali Solution.** V. V. Losev. *Journal of Applied Chemistry of the USSR,* v. 29, June 1956, p. 1031-1032. (Translated by Consultants Bureau Inc., 227 W. 17th St., New York 11, N. Y.)

Brief review of electrochemical surface oxidation of iron and steel. 8 ref. (R1h; Fe, ST)

220-R. (French.) **Protection Against Corrosion of High-Tension Cables of Steel Tubing Under Fluid Pressure.** J. Changarnier and J. Rollin. *Corrosion et Anticorrosion,* v. 5, Jan. 1957, p. 2-9.

Technical and economic advantages of such underground cables; nature of cathodic protection and electrical equipment used; practical applications. (R8, R10d; ST, 4-10)

221-R. Protective Sodium Benzoate Impregnated Jute Wrappings for Steel Parts. T. H. Soutar. *Corrosion Prevention & Control,* v. 4, Feb. 1957, p. 47-49.

Polished steel shafting exposed for 12 months to chemistry laboratory atmosphere showed no corrosion when wrapped in impregnated jute. However, incorporation of wax in the impregnating solution was conducive to rusting. 3 ref. (R10f; ST)

222-R. Prevention of Corrosion: Cathodic Protection of Iron and Steel Structures. *Electrical Review,* v. 160, Mar. 15, 1957, p. 481-482.

Two means of applying cathodic protection: the "sacrificial-anode" and the "power-impressed" method. (R10d; ST)

223-R. Corrosion of Mild Steel by Aqueous Ammonium Thiocyanate. L. A. Ravald, J. W. Chilver and R. Williams. *Journal of Applied Chemistry,* v. 7, Mar. 1957, p. 113-117.

Mild steel was exposed at room temperature and in stagnant conditions to aqueous 1.0 *N* and 0.1 *N* ammonium thiocyanate at various pH values, to ascertain the respective pH ranges of uniform attack, localized attack and complete inhibition. For comparison, similar experiments were made with ammonium chloride and with ammonium sulphate. 4 ref. (R6j; CN)

224-R. Anti-Corrosion Measures for Large Steel Pipelines. R. Drake. *Pipes and Pipelines,* v. 1, Mar. 1957, p. 15-18.

Protection techniques for steel pipes which can insure resistance to corrosion under all normal operating conditions; pretreatments, internal protection, external protection and cathodic protection described. (R10; ST, 4-10)

225-R. Corrosion Studies of Carbon Steel in Alkaline Pulping Liquors by the Potential-Time and Polarization-Curve Methods. Pt. II. Mixtures of White With Oxidized or Nonoxidized Black Liquor. W. A. Mueller. *Tappi,* v. 40, Mar. 1957, p. 129-140.

Influence of secondary factors on the polarization curve, such as stirring, the formation of iron sulphide deposits on the electrodes, and duration of the experiment. 23 ref. (R7; CN)

226-R. Studies of the Oxidation and Contamination Resistance of Binary Niobium Alloy. T. Sims, William D. Klopp and Robert I. Jaffee. Battelle Memorial Institute. *U.S. Atomic Energy Commission,* BMI-1169, Feb. 19, 1957, 52 p.

Study of the effects of binary alloying additions on the oxidation and contamination resistance of columbium was conducted. Alloys contained up to 35 at. % titanium, chromium, and zirconium, 25 at. % vanadium, molybdenum, tantalum and tungsten, and 5 at. % beryllium, boron, cobalt, iron, manganese, nickel and silicon. The oxidation and contamination studies were conducted in air at 600, 800 and 1000° C. Contamination was investigated by hardness-penetration measurements on all oxidized alloys except those

containing beryllium or boron. 8 ref. (R1h, 1-10; Cb)

227-R. (French.) **Research on Corrosion Produced by Alternating Currents.** Lucien Amy and Claude Mounios. *Revue Générale de l'Electricité,* v. 66, Mar. 1957, p. 187-188.

Laboratory experiments establish possibility of production of notable corrosion phenomena on metal piping by means of stray alternating currents of industrial frequency. (R1j; R11)

228-R. (German.) **Effect of Hydrogen Fluoride and Hydrofluoric Acid on Materials.** E. Lingnau. *Werkstoffe und Korrosion,* v. 8, Apr. 1957, p. 216-233.

Unalloyed steels, nickel, copper, silver and lead are resistant to hydrofluoric acids of moderate concentrations. Ingot steel is resistant even to acids of more than 65%. Aluminum and titanium are corroded by hydrofluoric acids of all concentrations though they are more or less resistant to dry hydrogen fluoride. 202 ref. (R6g)

229-R. (Italian.) **Deposits and Corrosiveness of Combustible Oils During Combustion: Measurements — Additives.** Maurizio Panetti. *Termotecnica,* v. 11, Mar. 1957, p. 127-132.

Ash deposits on metal and nonmetallic parts of heating equipment; methods of measuring corrosiveness of residual oils; available corrosion preventives. Attempts to establish, in case of a gas turbine, maximum percentages of harmful elements compatible with proper functioning of equipment: study limited to sodium, vanadium and sulphur. 8 ref. (R7d; RM-k)

230-R. (Japanese.) **Study of Corrosion Fatigue; Method of Measuring Damage Caused by Corrosion Fatigue.** Kanetoshi Iwamoto. *Japan Society of Mechanical Engineers, Transactions,* v. 23, Mar. 1957, p. 238-241.

After specimens were corroded with a water stream under various magnitudes of rotary bending stress and for various times, they were subjected to fatigue tests in air under a stress, which was about 20% larger than the fatigue limit of the material. (R1e, R11)

231-R. (Swedish.) **Scaling of 18-8 Stainless Steel in Reheating Furnace Atmospheres.** John Olof Edström. *Jernkontorets Annaler,* v. 141, no. 3, 1957, p. 105-145.

The structural pattern of oxide layers formed on 18-8 steel at 1050° C. in different types of atmosphere was studied by microscopic and X-ray diffraction methods. Special attention was paid to the microstructure of flaking and adherent oxide layers and to the influence of sulphur on the oxidation structures. 45 ref. (R2q, J2k; SS)

232-R. (Pamphlet.) **Corrosion Testing Methods, Monel, Inconel, Nickel and Nickel Alloys. Technical Bulletin T-10.** 17 p. Aug. 1956. International Nickel Co. Inc., 67 Wall St., New York 5, N. Y.

Discussion of laboratory tests, plant tests and service tests. (R11; Ni)

233-R. Corrosion: Its Implications in Aircraft. Reginald Tate. *Chemistry and Industry,* no. 17, Apr. 27, 1957, p. 506-508.

Survey of aircraft alloys; meaning of corrosion damage in aircraft; corrosion of engine parts and exhaust components. (R general, T24, 17-7)

234-R. Corrosion Research Laboratories. Pt. II. Fulmer Research Institute. H. K. Farmery. *Corrosion Technology,* v. 4, Apr. 1957, p. 125-127.

Functions, facilities and some of the current work of a British research organization. 7 ref. (R general, A9h)

235-R. Corrosion, Its Causes, Cost and Prevention. W. Harris. *Corrosion Technology,* v. 4, May 1957, p. 162-164.

Brief history of corrosion research and suggested expansion in training programs and cost of corrosion in Great Britain. 13 ref. (R general, A9, A3, 17-3)

236-R. Corrosion in a Corn Milling Plant. Charles H. Pelton. *Industrial and Engineering Chemistry,* v. 49, May 1957, p. 65A-74A.

Specific corrosion problems with emphasis on selection of materials. (R general, T29p, 17-7)

237-R. Corrosion and Corrosion Resistant Coatings. J. H. Payne. *Inspection Engineer,* v. 21, Jan-Feb. 1957, p. 2-10.

Examples of corrosion; methods of corrosion prevention, including metallizing. (R general, L23)

238-R. Corrosion. Pt. I. What It Is; What It Does. George E. Symons.

Water and Sewage Works, v. 104, May 1957, p. 210-213.

Definitions, phenomena and tests. (R4)

239-R. Current-Voltage Relationship of Galvanic Anode Arrays in Cathodic Protection. L. J. Waldron and M. H. Peterson. *U.S. Office of Technical Services,* PB 121821, Feb. 1957, 19 p. $.50.

Current outputs of five different sizes of galvanic anode arrays used by the Navy for the cathodic protection of ship hulls are described in a Navy research report. In tests, impressed-current sheet steel anodes were substituted for conventional galvanic anodes. It was found that the addition of anodes was more efficient than a moderate separation of anodes in increasing the total current output. (R10d; ST)

240-R. (English.) **Corrosion of Refractory Materials in Melts. Pt. I. Method for Quantitative Measurement of the Dissolution of Refractory Materials in Melts by Use of Radioactive Isotopes.** H. Flood and A. Seltveit. *Det Kongelige Norske Videnskabers Selskabs,* v. 28, no. 27, 1955, p. 150-153.

Small rods of refractory material are irradiated in a uranium pile and then corroded in a melt. The dissolution of the rod is followed by measuring the increase of the radioactivity of the melt. This method makes it possible to examine in a simple way the rate of corrosion as a function of time. 5 ref. (R6m; RM-h, 14-13)

241-R. (French.) **General Report of the Congress.** M. P. Lacombe. *Chimie & Industrie,* v. 77, Apr. 1957, p. 29-32.

Summarizes the main patterns of thought revealed by 24 papers presented at the European Corrosion Congress in November 1956. Present-day tendencies of scientific research into corrosion, industrial applications, modern processes of protection. Fundamental research conducted into corrosion, methods of study, methods of testing, methods of protection, problems of atmospheric corrosion and light alloys. (R general, A9)

242-R. (French.) **New Methods of Studying Corrosion at High Temperature.** J. Brefort and G. Valensi. *Corrosion et Anticorrosion,* v. 5, Apr. 1957, p. 106-111.

Description of a new heat balance with photo-voltaic cell furnishing a sensitivity of 1/10 mg. for a charge of 200 g. with a view to the study of dry rust. Study of corrosion by liquids or saturated vapor by means of the measurement of the electrical conductivity of the residual metal. 12 ref. (R11a, 2-12)

243-R. (French.) **Behavior of Nickel and Nickel Alloys in the Presence of Halogens.** L. Arbellot. *Corrosion et Anticorrosion,* v. 5, Apr. 1957, p. 112-118.

Information on the resistance to corrosion of pure nickel, Monel, Inconel, 18-8 stainless steel and nickel-molybdenum alloys (Hastelloys). Effect of dry and wet halogens, hydrochloric acids, hydrofluoric and solutions of these acids. (R6; Ni, SS)

244-R. (French.) **Corrosion of Cooling Equipment in Refining.** Marcel Prillieux. *Corrosion et Anticorrosion,* v 5, Apr. 1957, p. 128-130.

Condenser failure in important units due to deep corrosive pitting by water has led to the investigation of the causes of this phenomenon. It seems that this corrosion is due to the weak oxygen content dissolved in the river water used for cooling. (R4a)

245-R. (French.) **New Aspects of the Oxidation of Metals and Alloys at High Temperatures.** J. Benard. *Corrosion et Anti-Corrosion,* v. 5, May 1957, p. 138-145.

Survey of recent findings in this field, concerning on the one hand the existence of a process of nucleation in the origin of the formation of an oxide film, and on the other modifications of the superficial microstructure of the metal after a prolonged period in a very weak oxidizing atmosphere. 20 ref. (R1h, 2-12)

246-R. (French.) **A Case of Biological Corrosion of Hydroelectric Works in Africa and the Action of Organic Products in This Corrosive Process.** P. Colomb. *Corrosion et Anti-Corrosion,* v. 5, May 1957, p. 153-155.

Endeavors to explain the failure of classic bituminous coatings in water pipes in a region of the Belgian Congo. None of the bacteria hitherto known for their corrosive action having been found in the mud deposits, harmful action was attributed to the presence of amino acids which were revealed by chemical and chromatographic analysis. (R1g; 8)

247-R. (French.) **Season Cracking of Brass.** J. M. Pouvreau. *Cuivre Lai-*

tons Alliages, no. 36, Mar-Apr. 1957, p. 41-45.

Consideration of the causes of this phenomenon under five heads: chemical composition of the alloy, existence of internal and external stress, surrounding corrosive atmosphere, sudden variations in temperature and form of the product. Possibilities of controlling this phenomenon and problems involved. (R1d; Cu-n)

248-R. (French.) **Results of Atmospheric Corrosion Tests Effected in Italy on Aluminum and Aluminum Alloys.** Eugenio Hugony and Giuseppe Luft. *Revue de l'Aluminium,* no. 242, Apr. 1957, p. 379-393.

Tests carried out by Instituto Sperimentale dei Metalli Leggeri concerned only aluminum or light alloy assemblies composed of rolled or extruded products, with or without surface protection. Factors taken into account included changes in appearance, reduction of the mechanical properties and alterations in microstructure. 11 ref. (R11, R3; Al)

249-R. (German.) **New View of the Passivity of Stainless Steel.** M. G. Fontana and W. P. McKinnell. *Werkstoffe und Korrosion,* v. 8, May 1957, p. 249-254.

Survey of recent publications on iron and stainless steels; discussion of recent work of the Ohio State University on adsorption of oxygen on stainless steel surfaces at room temperature. 35 ref. (R10c; SS)

250-R. (German.) **Investigations on the Current Density Distribution of Cathodic Protection in Different Soils.** M. Solti. *Werkstoffe und Korrosion,* v. 8, May 1957, p. 256-260.

Experimental cell consisting of a piece of a steel tube and a parallel auxiliary anode was buried in soils of different chemical properties. The cathodic polarization curves were measured by means of the Holler method. The potentials at different spots were measured under certain external current intensities by point source anodes. (R10d, R8)

251-R. (German.) **Tensile Corrosion and the Theory of Tenacity.** K. Matthaes. *Werkstoffe und Korrosion,* v. 8, May 1957, p. 261-277.

The corrosion crack is theoretically a tensile crack like red shortness (weld crack) and the solder crack; the conditions of occurrence of these kinds of cracks are the presence of two different kinds of atoms in the same lattice and the presence of elastic and over-elastic tensions. 81 ref. (R1d, 9-22)

252-R. (German.) **Influence of Light Upon the Corrosion of Iron in Aqueous Solutions.** B. Lovrécek and E. Korkut. *Werkstoffe und Korrosion,* v. 8, May 1957, p. 277-280.

Corrosion rate of steel specimens exposed to light is about 20% higher than that of those not exposed. To clarify the mechanism of this corrosion the potentials of specimens in the same solutions were plotted against time. (R6; Fe)

253-R. (Japanese.) **Action of Heated Water With Surface of Aluminum.** Ichiro Sato. *Electrochemical Society of Japan, Journal,* v. 25, Jan. 1957, p. 8-12.

It is a well-known fact that the formation of boehmite (alpha-Al_2O_3 H_2O) will be seen when aluminum is immersed in hot water at about 80° C. The mechanism of the formation of boehmite was investigated from electrochemical point of view. 10 ref. (R4, 1-16; Al)

254-R. **Avoidance of Stress Corrosion in Austenitic Steel Equipment.** C. Edeleanu. *Chemical and Process Engineering,* v. 38, May 1957, p. 181-184.

Present state of knowledge of stress-corrosion; corrosion in plant using chloride or caustic solutions and plant using water or steam. 7 ref. (R1d; SS)

255-R. **Cyclohexylamine Carbonate as a Volatile Corrosion Inhibitor.** C. A. Rhodes. *Corrosion Prevention and Control,* v. 4, Apr. 1957, p. 37-39, 42.

Powerful rust inhibiting action on ferrous metals, with protective action for chromium plate, nickel, Monel metal, lead, zinc and aluminum, even in the presence of water droplets and vapor; closed space necessary to prevent loss of inhibitor vapor; applications include protection of aircraft engines, tin plate, mild steel pans, etc. (R10b)

256-R. **Corrosion Research in the USSR.** *Corrosion Prevention and Control,* v. 4, Apr. 1957, p. 49-50, 56.

Brief abstracts from Russian research on corrosion of aluminum, Armco iron, carbon steel, cast iron, nickel, copper, lead, stainless steels and tantalum by chlorine; effect of cathodic and anodic polarization to sensitivity of magnesium alloy to corrosive attacks. Corrosion rates

of sulphuric acid on zinc and antimony; iron corrosion in alkaline solution. (R6)

257-R. Cathodic Protection in Military Construction. Lindsay M. Applegate. *Military Engineer,* v. 49, May-June 1957, p. 188-191.

A number of installations described and evaluated. (R10d)

258-R. Low pH Receiver Waters Cut Corrosion in a Crude-Oil Unit. And After-Effects Have Been Eliminated. J. A. Diehl and E. A. Schnake. *Oil and Gas Journal,* v. 56, May 20, 1957, p. 157-165.

After 27 months of operation with pH of about 4.3 and inhibition injections at 10 to 15 ppm., after-effects have been eliminated and equipment protected from corrosion. 7 ref. (R4a, T29n)

259-R. How 31 Companies Are Fighting Corrosion in Cat Reforming. E. B. Backensto. *Oil and Gas Journal,* v. 56, May 20, 1957, p. 180-190.

Difficulties are excessive metal loss, heavy scaling of furnace tubes, plugging of catalyst beds and fouling of heater and exchanger tubes. The following preventive steps are being taken: use of proper alloys, desulphurization of feed stock, removal of hydrogen disulphide from recycle gas and aluminizing. 17 ref. (R general, T29r)

260-R. Survey Reveals Reformer Corrosion Data. E. B. Backensto. *Petroleum Refiner,* v. 36, May 1957, p. 201-204.

The most frequently encountered difficulties related to corrosion were excessive metal loss; heavy scaling of furnace tubes, exchangers, and transfer lines; plugging of catalyst beds and fouling of heater and exchanger tubes. Most widely used methods to combat corrosion are given. (R general, T29n)

261-R. Corrosion—What You Can Do About It. D. Kut and S. Kut. *Plant Engineering,* v. 11, May 1957, p. 139-140.

Mechanism and prevention of boiler equipment corrosion. (R4c)

262-R. External Casing Corrosion —Where Is It? How Bad Is It? J. D. Sudbury. *World Oil,* v. 144, May 1957, p. 210-222.

Casing examined to a depth of about 5200 ft., corrosion is described and preventive measures recommended. (R7a)

263-R. (French.) **An Up-to-Date Look at Methods of Fighting Corrosion.** Jean Kettler. *Usines d'Aujourd'hui,* no. 35, p. 79-82.

Review of two methods of combatting corrosion of metals: (1) elimination of harmful agents; (2) protective coatings. (R10a, L general)

264-R. (French.) **Practical Methods of Fighting Corrosion.** *Usines d'Aujourd'hui,* no. 35, p. 87-101.

Properties of commercial products (paints, varnishes, metallic and plastic coatings) for surface protection; engineering firms specializing in corrosion problems; corrosion testing equipment. (R10, R11, L general)

265-R. Oxidation of Hafnium. W. W. Smeltzer and M. T. Simnad. *Acta Metallurgica,* v. 5, June 1957, p. 328-334. (CMA)

Oxidation data for hafnium subjected to 760 mm. of oxygen were obtained for the range 350-1200° C. Data for the range 350-710° C. are plotted according to a logarithmic equation, those for the range 350-800° C. according to a parabolic equation, and those for the range 900-1200° C. according to a linear equation. The respective activation energies for these rate constants are 11.4, 36.0 and 26.1 k-cal. per mole. The formation of a duplex scale (outer porous and inner compact oxides) transforms the rate from parabolic to linear. Monoclinic HfO_2 is the surface oxide. (R2h; Hf)

266-R. Hydrogen Effusion Method for the Determination of Corrosion Rates in Aqueous Systems at Elevated Temperature and Pressure. M. C. Bloom and M. Krulfeld. *Electrochemical Society, Journal,* v. 104, May 1957, p. 264-269.

Apparatus and technique for determining corrosion rate at elevated temperature and pressure from rate of hydrogen effusion; results obtained for low-carbon steel capsules show good reproducibility and compare with independent method. 9 ref. (R11a, R4; CN)

267-R. Galvanic Corrosion. Pt. 1. Current Flow and Polarization Characteristics of the Aluminum-Steel and Zinc-Steel Couples in Sodium Chloride Solution. M. J. Pryor and D. S. Keir. *Electrochemical Society, Journal,* v. 104, May 1957, p. 269-275.

Measurements of current flow, weight loss and polarization carried out on aluminum, mild steel and zinc mild steel couples in normal

sodium chloride solutions at 25° C.; aluminum and zinc were anodic to mild steel under wide variety of experimental conditions. 20 ref. (R1a; Al, CN Zn)

268-R. Scaling of 18-8 Stainless Steel in Reheating Furnace Atmospheres. John Olof Edstrom. *Iron and Steel Institute, Journal,* v. 185, Apr. 1957, p. 450-466.

Studies structure of oxide scales formed on 18-8 stainless steels at 1050° C. and in different types of reheating atmosphere by microscopy and X-ray diffraction. Follows conditions for formation of flaky and adherent oxides and presents hypothesis on scaling mechanism. Explanation of varying influence of sulphur in oxidation process in reducing and oxidizing types of atmospheres. 45 ref. (R2q; SS)

269-R. Investigation Into the Catastrophic Corrosion of a Flake Graphite Cast Iron in Carbon Dioxide Containing a Small Amount of Carbon Monoxide. S. R. Billington and B. C. Woodfine. *Metallurgia,* v. 55, May 1957, p. 213-220.

Metallographic data on the oxidation behavior of pearlitic flake graphite cast iron in carbon dioxide and carbon monoxide-carbon dioxide mixtures at temperatures from 375 to 525° C. under gas pressure of approximately 14.5 atm. for time up to 3000 hr.; X-ray and electron diffraction examination of phases present in outer scale; suggested mechanism to account for higher rate of oxidation observed in the carbon monoxide-carbon dioxide mixture at 525° C. 3 ref. (R1h, M27; CI)

270-R. Dissolution of Tungsten in Mixtures of Hydrofluoric and Nitric Acids. D. Robbins. *Metallurgia,* v. 55, May 1957, p. 257-259.

Investigation on solubility of tungsten in mixtures of hydrofluoric and nitric acids. Mixture with 40% nitric and 60% by volume concentrated hydrofluoric acid dissolves metal most readily. (R6g; W)

271-R. Factors in the Selection of Corrosion Resistant Materials. F. L. Whitney, Jr. *Metal Progress,* v. 71, June 1957, p. 90-96.

Ease of fabrication (especially field welding without damage), corrosion rate and cost are most important items, but operating factors —such as temperature, concentration purity and velocity of corrosive fluid, erosion by sludge, concentration cells under adhering solids—are of equal influence on the over-all economics. (R general; SGA-g)

272-R. How Corrosion Attacks Well Casing. Y. W. Titterington. *Oil and Gas Journal,* v. 56, May 27, 1957, p. 136-140.

Cathodic protection has become a reliable and useful method of protecting well casing from external corrosion. Current requirements are determined from either downhole potential-drop surveys or wellhead-current-potential measurements. 5 ref. (R10d)

273-R. Sodium Corrosion and Oxidation Resistance of High-Temperature Brazing Alloys. G. M. Slaughter, C. F. Leitten, Jr., P. Patriarca, E. E. Hoffman and W. D. Manly. *Welding Journal,* v. 36, May 1957, p. 217s-225s.

Testing procedure and results of tests on Inconel T joints, brazed with a large number of commercial and experimental high-temperature brazing alloys to determine resistance to sodium corrosion and high-temperature oxidation; testing time ranged from 100 to 1300 hr. and testing temperatures of 1500 and 1700° F. were used; types of alloys tested included nickel-silicon-boron alloys, nickel-chromium-silicon, nickel - chromium - silicon - boron, nickel-chromium-phosphorus, nickel-phosphorus, nickel-manganese and many others. (R6, K1h; SGA-f)

274-R. Corrosion Test Procedure for the Selection of Crystal Bar Zirconium for Use in Naval Reactor Fuel Elements. V. F. Saitta. *U.S. Atomic Energy Commission,* ANL-4450, May 10, 1950, 11 p. (CMA)

Equipment and a procedure have been developed for the corrosion testing of zirconium for naval reactor elements. The test water is at 600° F. and 1550 psi. for 168 hr. Zirconium bars selected for cover plate material for fuel elements must be coated with a very adherent iridescent surface tarnish; corrosion products must be absent. The test outlined gives reliable and reproducible results. (R11, T11g, 17-7; Zr)

275-R. (French.) Contribution to the Study of Factors Governing Rupture of Mild Steel Subjected to Tension in a Hydrogen Sulphide Saturated Acid Solution. Eugene Herzog. *Comptes Rendus,* v. 244, Mar. 11, 1957, p. 1499-1502.

Importance of the nature of carbides on the propagation of ruptures in an acid medium, whether saturated with hydrogen sulphide or not. (R1d, R6g; CN)

276-R. (French.) **Intergranular Corrosion by Hydrochloric Acid on Aluminum Refined by the Zone Melting Process.** Frederick Montariol. *Comptes Rendus,* v. 244, Apr. 15, 1957, p. 2163-2166.

Study of corrosion process on heat treated specimens immersed in a 22% solution of pure hydrochloric acid. 4 ref. (R2h, R6g; Al)

277-R. (French.) **Role of Surface Carburization in Reactions of Organic Vapors on the Surface of Tungsten (Case of Acetaldehyde).** P. Le Goff and M. Letrot. *Journal de Chimie Physique,* v. 54, Jan. 1957, p. 3-14.

Study of decomposition of acetaldehyde and oxidation of tungsten at very low pressure and in a dynamic system. Only substances produced in decomposition are CO, H_2 and free carbon, to the exclusion of all free radicals. Decomposition becomes measurable at 1300° K. and is practically total at 1700° K. 16 ref. (R1h; W)

278-R. (French.) **Electrographic Study of Oxide Films Appearing on Aluminum and Nickel Subjected to an Electric Discharge in a Gaseous Oxygen Medium.** D. V. Ignatov. *Journal de Chimie Physique,* v. 54, Jan. 1957, p. 96-105.

Complexity of conditions of formation of an oxide film in a liquid medium and possibility of a secondary reaction between the oxide and the electrolyte impede accurate study of formation of oxide films. Simplified conditions using an electric field during interaction of oxygen on metal were created in an electric discharge tube in a gaseous medium and permitted basic conclusions on mechanism of oxidation of aluminum and nickel. 4 ref.
(R1h, R11m; Al, Ni)

279-R. (French.) **Corrosion of Hulls by Stray Electric Welding Currents.** M. Giannoti. (Translated from "Rivista Marittima", May 1956.) *Navires, Ports et Chantiers,* no. 84, May 1957, p. 350-352.

Characteristics of this type of corrosion; how to identify; preventive measures for both old and new vessels. (R1j, T22g; ST)

280-R. (French.) **Corrosion of Metals by Olein.** M. Loury and C. Defromont. *Revue Francaise des Corps Gras,* v. 3, June 1956, p. 436-444.

Corrosion of oil drums during transport and storage; methods of protecting existing containers; new corrosion resistant containers and types of metals that can be used; effects of olein on various metals; corrosion resistance tests; research on corrosion inhibitors. (R7e, R10b)

281-R. (French.) **First European Congress on Corrosion.** J. L. Rabate. *Technique de l'Eau et de l'Assainissement,* no. 123, Mar. 15, 1957, p. 47-49.

Summary of main points of reports presented to Congress (Paris, 11/18-12/3/56) on the following general themes: Methods of combatting corrosion; corrosion and protection of manufactured objects; economic aspects of corrosion. (R general)

282-R. (Japanese.) **On the Corrosion Resistance of Titanium Alloys.** S. Yoshida, S. Okamoto and T. Araki. *Japan Institute of Metals, Journal,* v. 21, Mar. 1957, p. 183-186. (CMA)

Binary titanium alloys with additions of aluminum, silver, cobalt, chromium, copper, iron, manganese, molybdenum, nickel, silicon, tin and tungsten were corrosion tested as hot and cold rolled plate 1 mm. thick. Corrosion media were the common mineral acids and bases, aqua regia, acetic, formic and oxalic acids and NaCl, $FeCl_3$ and $AlCl_3$ at 25° C. and boiling. Ti-20Mo was highly resistant to hydrochloric acid and sulphuric acid, but less so to nitric acid than titanium. Alloying improved the corrosion resistance to organic acids and $AlCl_3$.
(R6, 2-10; Ti)

283-R. **Corrosion Keys — Titanium (Commercially Pure).** D. L. Macleary. *Chemical Processing,* v. 20, July 1957, p. 67, 69, 71, 73. (CMA)

Data presented graphically for the corrosion resistance of commercial titanium in organic acids, acetic acid or anhydride aromatic compounds, metal chlorides, aerated and unaerated mineral acids, liquid metals, sulphur, hydrogen peroxide, photographic emulsions, formaldehyde, ethanol, ammonia and gas mixtures. (R6, R7; Ti-a)

284-R. **Corrosion Keys—Zirconium (Commercial Grade).** W. E. Kuhn. *Chemical Processing,* v. 20, July 1957, p. 75, 77. (CMA)

Corrosion data presented graphically for commercial zirconium in

HCl, H_2SO_4, H_3PO_4 and HNO_3, exposed and unexposed to air. (R6q; Zr)

285-R. Corrosion Resistance of Ductile Iron in Sea Water and Petroleum Tanker Services. Michel Paris and B. de la Bruniere. *Corrosion,* v. 13, May 1957, p. 292t-296t.

Laboratory data compare corrosion resistance of gray cast iron, steel, and ductile or nodular cast iron in sea water and various acid solutions of different concentrations; performance tests of ductile iron when used as product lines on petroleum tanker. (R4b, R6g; CI-r)

286-R. Corrosion Studies in High Temperature Water by a Hydrogen Effusion Method. M. C. Bloom, M. Krulfeld, W. A. Fraser and P. N. Vlannes. *Corrosion,* v. 13, May 1957, p. 297t-302t.

Method based on rate of hydrogen effusion from sealed containers being corroded by the aqueous solutions they contain; corrosion rate of low-carbon steel in distilled water at 600° F.; effect of pH, thermal shock, temperature rise and heat treatment of metal on corrosion rate; comparison of rates for low-carbon and stainless steels. 9 ref. (R4, 2-12, R11a)

287-R. Theoretical Studies and Laboratory Techniques in Sea Water Corrosion Testing Evaluation. F. L. LaQue. *Corrosion,* v. 13, May 1957, p. 303t-314t.

Use of sodium chloride synthetic sea water and natural sea water in tests for determining behavior of metals in sea water; data on corrosion rates of copper alloy, zinc and cold rolled steel in natural and synthetic sea waters; considers spray tests and effects of high velocity turbulence and jet impingement. Other topics include corrosion fatigue tests, crevice corrosion, galvanic potentials, polarization and cavitation erosion. 28 ref. (R4b, R11)

288-R. Study of Current Distribution in Cathodic Protection. E. E. Nelson. *Corrosion,* v. 13, May 1957, p. 315t-320t.

Theoretical analysis made of the effects of solution resistance and cathodic polarization on the current distribution in cathodic protection of metals; experimental study on distribution of current on a large sea wall cathode as affected by the magnitude of applied current and by shield around the anode; solution resistance calculation and effect of paint films on current distribution. 6 ref. (R10d)

289-R. Inhibiting Effect of Hydrofluoric Acid in Fuming Nitric Acid on Corrosion of Austenitic Chromium-Nickel Steels. Clarence E. Levoe, Daivd M. Masom and John B. Rittenhouse. *Corrosion,* v. 13, May 1957, p. 321t-328t.

Measured rate of corrosion of welded and unwelded chromium-nickel steels, Uniloy 19-9DL, 19-9DX and alloy 321 by fuming nitric acid with and without hydrogen chloride as a corrosion inhibitor; evaluated effect of heat treatment on rate; rate measurements at temperatures from 100 to 160° F. 3 ref. (R6g, R10b; SS-e)

290-R. Corrosion by Low-Pressure Geothermal Steam. T. Marshall and A. J. Hugill. *Corrosion,* v. 13, May 1957, p. 329t-337t.

Corrosion rate tests in geothermal steam contaminated with chlorides, hydrogen sulphides and carbon dioxide for a number of ferrous alloys including carbon and low-alloy steels, stainless steels and cast irons and nonferrous alloys including copper, aluminum, titanium and nickel-base alloys. 17 ref. (R4d; CN, AY, SS, CI, Cu, Al, Ti, Ni)

291-R. Testing Methods and Corrosion Control Measures for Buried Telephone Cable. Daniel R. Werner. *Corrosion,* v. 13, May 1957, p. 338t-344t.

Testing methods for determining current flow pattern between cable and soil; data used to determine probable life of cable from corrosion standpoint; economic feasibility of corrosion control measures. 6 ref. (R10d, T1b)

292-R. Evaluation of Laboratory Testing Techniques for Cooling Water Corrosion Inhibitors. NACE Technical Committee Report. *Corrosion,* v. 13, May 1957, p. 345t-346t.

Dynamic flow, spinning rod, spinning disk and static corrosion inhibitor testing techniques employed to determine the best method of testing polyphosphate and organic chromate inhibitors; results obtained compared to those from pilot plant studies. (R11, R10b, R4a)

293-R. Some Observations on Cathodic Protection Criteria. NACE Technical Committee Report. L. P. Sudra-

bin and F. W. Ringer. *Corrosion*, v. 13, May 1957, p. 351t-357t.

Compares cathodic protection criteria, including measurement of closure circuit flow between zinc plates and pipes; McCollum Earth current meter; pipe to reference electrode potential and apparent break in polarization curve, on a buried 240-ft. length of bare 6-in. steel pipe. 36 ref. (R10d; ST, 4-10)

294-R. Corrosion of Iron in High Temperature Water. Pt. 1. Corrosion Rate Measurements. D. L. Douglas and F. C. Zyzes. *Corrosion*, v. 13, June 1957, p. 361t-374t.

Method of measuring corrosion rate depends on analysis by mass spectrometer of the hydrogen collected in helium during corrosion period; used in measuring corrosion of Armco iron and high-purity vacuum cast iron over temperature range of 240 to 360° C.; effects of surface finish temperature and heat treatment. 39 ref.
(R4a, 2-12, R11; Fe, CI)

295-R. Corrosion of Stainless Steels in Supercritical Water. W. K. Boyd and H. A. Pray. *Corrosion*, v. 13, June 1957, p. 375t-384t.

Investigation of corrosion behavior and weight change of 12 stainless steels, both hardenable and nonhardenable grades in degassed supercritical water at 800, 1000, 1350° F. and at pressure of 5000 psi. for periods up to 130 days; limited study of the effect of applied stress on corrosion resistance and behavior of stainless steels in degassed water of 1000° F. in presence of hydrogen. (R4 2-12; SS)

296-R. Some Case Histories of Stress Corrosion Cracking of Austenitic Stainless Steels Associated With Chlorides. H. R. Copson and C. F. Cheng. *Corrosion*, v. 13, June 1957, p. 397t-404t.

Presents 22 case histories of stress-corrosion cracking in types 302, 304, 316, 321 and 347 stainless steels which occur in water, steam, brines and miscellaneous solutions where chloride content was high or became concentrated; laboratory tests show increasing resistance to cracking with addition of nickel to steel alloys. 29 ref. (R1d, 2-10; SS-e)

297-R. A Corrosion Problem in Large Steam Generating Stations. T. J. Finnegan. *Corrosion*, v. 13, June 1957, p. 405t-409t.

Probable causes of internal corrosion leading to failure of boiler tubes; suggests role of black iron oxide; recommends protective measures. (R4c)

298-R. Shipboard Evaluation of Zinc Galvanic Anodes Showing the Effect of Iron, Aluminum and Cadmium on Anode Performance. E. C. Reichard and T. J. Lennox, Jr. *Corrosion*, v. 13, June 1957, p. 410t-416t.

Results of 9, 12 and 15 months performance tests on commercial size zinc galvanic anodes on five active ships and quiescent marine exposures; data on effect of small percentages of iron, aluminum and cadmium on the current output.
(R10d, R4b; Zn)

299-R. Atmosphere Affects the Stress-Corrosion Failure of High Brass. C. H. Hannon. *Corrosion*, v. 13, June 1957, p. 417t-418t.

Effects of ammonia, oxygen, nitrous oxide, ozone and their mixtures on highly stressed brass test pieces. (R1d; Cu-n)

300-R. Corrosion in Scotch Marine Boilers. Pt. I. Model Boiler Tests on the Corrosion of Mild Steel Tubes in Highly Saline Waters. F. Wormwell, G. Butler and J. G. Beynon. *Institute of Marine Engineers, Transactions*, v. 69, Apr. 1957, p. 109-120.

Model boilers have been used to carry out qualitative and semiquantitative experiments on the corrosion of internally heated boiler tubes in conditions simulating those in Scotch boilers. The depth of pitting on mild steel boiler tubes in distilled water with additions of sea water increases with the density of the solution. Effect of various conditions on the depth of pitting are noted. Some evidence was obtained that small amounts of copper in the steel reduce the likelihood of deep pitting and perforation. Removal of the mill scale by grit blasting or pickling does not improve the corrosion resistance of the tubes. 11 ref.
(R4b, 2-10; ST, *Cu*)

301-R. Corrosion in Scotch Marine Boilers. Pt. II. Model Boiler Tests on the Influence of the Copper Content of the Steel on the Corrosion of Tubes in Artificial Sea Water. G. Butler and H. C. K. Ison. *Institute of Marine Engineers, Transactions*, v. 69, Apr. 1957, p. 121-128.

Model boiler tests have been carried out to determine the influence

of the copper content of the steel on the corrosion resistance of mild steel boiler tubes in artificial sea water. Experiments with steels containing from less than 0.01% copper to 0.20% have shown the value of copper in reducing the severity of pitting of tubes in the acid conditions that develop in the boiler when the water is not treated. 18 ref. (R4b, 2-10; ST, *Cu*)

302-R. Investigation of Mechanical Properties, Corrosion Resistance, and Oxidation Resistance of Thermenol, an Iron - Aluminum - Molybdenum Alloy. K. L. Kojola. Bureau of Ordnance, Report 5190. *U. S. Office of Technical Services,* PB 121837, Aug. 1956, 29 p.

Data were obtained on thermenol concerning its resistance to salt spray corrosion and high-temperature oxidation (relative to other materials), its mechanical properties at room and high temperatures, and its macro and microstructure. (R1h, R4b, 2-12, Q general; Fe, *Al, Mo,* SGA-h)

303-R. Corrosion Resistance of Zircaloy-2 Brazements in High-Temperature Water. J. B. McAndrew, H. Schwartzbart and R. Necheles. *Welding Journal,* v. 36, June 1957, p. 287s-290s. (CMA)

Simple brazements of Zircaloy-2 withstood corrosion in 680° F. pressurized water longer than 1200 hr. The successful test fillers included alloys such as Ni-20Pd-10Si, Ni-30Ge-13Cr, Cu-20Pd-31In, Zr-5Be and Zr-10Fe-10Cr. Notable among the failures were Zr-10Fe-10Pd and Zr-15Fe-15Mn. The effect of spacing shims was investigated. (R4a, 2-12; Zr, 7-2)

304-R. (English.) **Investigation on Acid-Resistant High-Silicon Iron. Pt. 4. Corrosion Resistance to Sulphuric Acid.** Hiroshi Sawamura, Osamu Tajima and Kyoichi Akamatsu. *Kyoto University, Faculty of Engineering, Memoirs,* v. 19, no. 1, Apr. 1957, p. 92-101.

Corrosion tests were carried out on acid-resistant high-silicon iron in sulphuric acid with various concentrations and temperatures. The effects of the acid concentration, temperature and duration of test are discussed. The appearance of the surface of the specimen is also examined. 4 ref. (R6g; Fe, *Si,* SGA-g)

305-R. (French.) **Protection Against Corrosion in Industrial Plants Using Steam.** R. Malicet. *Corrosion et Anticorrosion,* v. 5, June 1957, p. 174-184.

Types of corrosion prevalent; various types of attack to which equipment is subjected; boilers, superheaters and piping; factors influencing the corrosion mechanism. (To be continued.) (R4d)

306-R. (French.) **Corrosion in the Research Program at Cebedeau.** E. Leclerc. *Corrosion et Anticorrosion,* v. 5, June 1957, p. 185-188.

Research currently in progress and projected at the Centre Belge d'Etude et de Documentation des Eaux (Cebedeau). Work is concerned with potable waters, soft waters and waters for boilers; an experimental high-pressure boiler is being built. 9 ref. (R4, Agh)

307-R. (German.) **Investigation Into Corrosion of Stainless Steel With 13% Chromium and 8% Nickel in Acids and Acid Mixtures.** Willi Machu and M. G. Fouad. *Archiv für das Eisenhüttenwesen,* v. 28, Mar. 1957, p. 157-165.

Determination of weight loss in hydrochloric, sulphuric, phosphoric acids and their mixtures; presence and absence of organic and inorganic inhibitors. 6 ref. (R6g, R10b; SS)

308-R. (German.) **Surface Corrosion Rule and Effect of Inhibitors on Electrochemical Corrosion.** H. E. Homig. *Werkstoffe und Korrosion,* v. 8, June 1957, p. 321-324.

This rule is valid under certain conditions only. These conditions can be derived from the fundamental rules of corrosion processes mathematically so that one can obtain a general law of which the classical surface rule is a special case. For anodic and cathodic controlled corrosion processes the surface rule is perfectly valid at certain ratios of the cathodic to the anodic areas, and only approximately valid at other ratios. Assuming a simplified mechanism for certain inhibitors it is possible to determine the effects of adding inhibitors from the general surface law. (R1a, R10b)

309-R. (German.) **Stress-Corrosion in Homogeneous Alloys, Characteristics and Mechanism.** L. Graf. *Werkstoffe und Korrosion,* v. 8, June 1957, p. 329-344.

The occurrence of stress-corrosion is dependent on the following conditions: characteristic susceptibility of an alloy to stress-corrosion; chemical action of a corroding agent upon

the less noble constituent of the alloy; tensile stress. The most important factor influencing the susceptibility of homogeneous mixed crystals to stress corrosion cracking is the amount of the mixed crystal concentration. 25 ref. (R1d)

310-R. (Italian.) **Corrosive Action of Vanadic Anhydride on Metals at Elevated Temperatures. Pt. III.** V. Cirilli and A. Burdese. *Metallurgia Italiana,* v. 49, May 1957, p. 320-326. (CMA)

In a study of the effect of the presence of aluminum and silicon in nickel-chromium steels on their resistance to the corrosive action of V_2O_5, it was found that, while small amounts of silicon improve the resistance, the presence of aluminum produces no favorable effect. These facts are correlated with the properties of the phase diagrams of the systems V_2O_5-Al_2O_3 and V_2O_5-SiO_2. In the former system the formation of the orthovanadate $AlVO_4$ takes place, which melts incongruously at 695° C.; in the latter system no compounds of SiO_2 with V_2O_5 are formed. 12 ref. (R6p, 2-10, AY, *Ni, Cr, V)*

311-R. (Japanese.) **Studies on the Corrosion Resistance of Titanium Alloys. Pt. 3. Corrosion Resistance of Ti-Ag, Ti-Cu, Ti-Fe, Ti-Co, Ti-W and Ti-Sn Alloys.** S. Yoshida, S. Okamoto and T. Araki. *Government Mechanical Laboratory, Journal,* v. 11, May 1957, p. 87-93. (CMA)

Arc melted, hot and cold rolled specimens of a number of binary titanium alloys were tested in 25° C. and boiling test solutions. The corrosion resistance of the alloys in H_2SO_4, HCL, HNO_3, aqua regia, oxalic acid, other organic acids, $FeCl_3$ and $AlCl_3$ is shown graphically. (R6g; Ti)

312-R. (Japanese.) **Utilization of Low-Grade Titanium Sponge Produced by the Kroll Process. Pt. II. The Oxidation of Ti-Fe Alloys at Elevated Temperatures in Air.** Kaxuo Hirayama, Torao Inagaki and Takeshi Takei. *Tokyo, Scientific Research Institute Reports,* v. 33, Mar. 1957, p. 58-64. (CMA)

The oxidation behavior of low-grade titanium containing up to 12% Fe (byproduct of the Kroll process) was studied between 500 and 1000° C. in air. In the vicinity of 500° C. the oxidation of the alloys was slight but increased at temperatures above 600° C. With increasing temperature, the oxidation of the alloys obeyed a simple law. With increased time (up to 36 hr.), the process progressed approximately according to the parabolic law. The iron contents of the low-grade titanium did not affect the oxidation appreciably. It was observed that the penetration of oxygen at temperatures above 800° C. was considerable. The structures of the resultant penetrated zone were investigated using microscopy, X-ray and electron diffraction. 6 ref. (R1h, 2-12; Ti, 6-24)

313-R. (Russian.) **Electrochemical Behavior of Titanium in Aqueous Solutions of Electrolytes.** Ya. M. Kolstyakin and P. S. Petrov. *Zhurnal Fizicheskoi Khimii,* v. 31, Mar. 1957, p. 659-672. (CMA)

In an electrochemical study of anticorrosive properties of titanium, hydrogen overpotential measurements were made at various current densities and pH values. The potential dependence of the reaction velocity is expressed by Tafel straight lines with slopes 0.100-0.140. While in acid solutions this velocity is proportional to the concentration of H_3O^+ ions, in alkaline solutions it is independent of the pH value. It is concluded that in the latter case H_2O molecules are the source of the liberated hydrogen. In acidified solutions of salts the nature of the reaction depends on the current density. While at low current densities the reaction is due to the discharge of H_3O^+ ions, at high current densities it is determined by the discharge of H_2O molecules. A notable activation of the surface of titanium is observed at negative potentials and at elevated concentrations of the acid. This activation also depends on the nature of the acid; it increases with acids in the order H_2SO_4, HCl, HF. 17 ref. (R6g, R11m; Ti)

314-R. Marine Cathodic Protection. A. J. Whitehead. *Corrosion Prevention & Control,* v. 4, June 1957, p. 59-60.

Description of a finned anode for installation in ballast tanks of oil tankers and in impressed current system for cases where there is no fire risk. (R10d)

315-R. Corrosion Problems in a Blast Furnace Water-Cooling System. H. B. Lloyd. *Corrosion Technology,* v. 4, July 1957, p. 221-224.

Techniques and designs employed to provide a practical solution to corrosion problems of a blast-furnace water cooling system based on

soft-water supply; water cooling system, external pipework and stave coolers are discussed. (R4a, D1, 1-2)

316-R. Prevention of Corrosion by Water Treatment. T. B. Fielden. *Corrosion Technology,* v. 4, July 1957, p. 225-229.

Corrosion and its prevention in boilers and their accessories. 33 ref. (R10a, R4)

317-R. Cationic Chemicals in Steam Plant. Filming Amines Prevent Condensate Line Corrosion. D. Bass and G. G. Sindery. *Corrosion Technology,* v. 4, July 1957, p. 230-234.

Protection from oxygen and carbon dioxide attack in steam-condensate systems obtained by use of filming amines. 5 ref. (R10b, R4d)

318-R. Role of Corrosion Inhibitors in Water Treatment. E. L. Streatfield. *Corrosion Technology,* v. 4, July 1957, p. 239-244.

Anodic, cathodic and organic inhibitors with special emphasis on amines. 12 ref. (R10b, R4)

319-R. Some Unusual Effects of Hydrogen in Corrosion Reaction. J. E. Draley and W. E. Ruther. *Journal of the Electrochemical Society,* v. 104, June 1957, p. 329-333.

Where metal surface is covered with a protective layer it is considered that some hydrogen ions diffuse through the layer and form hydrogen atoms beneath, thereby decreasing corrosion resistance. Three types of harmful effects are illustrated. 18 ref. (R1; *H*)

320-R. Kinetics of the Oxidation of Chromium. Earl A. Gulbransen and Kenneth F. Andrew. *Journal of the Electrochemical Society,* v. 104, June 1957, p. 334-338.

Study of conditions under which chromium fails in oxidation. Failure occurs when a rapid reaction develops in which diffusion processes are no longer rate controlling, resulting in poor adhesion of the oxide to the metal. Studies were made from 700-1100° C. using vacuum microbalance method. 15 ref. (R1h; Cr)

321-R. Corrosion Behavior of Zirconium-Base Uranium Alloys. U. Merten and D. C. Belouin. *U. S. Atomic Energy Commission,* KAPL-1570, June 15, 1956, 25 p. (CMA)

The corrosion resistance of zirconium containing 7-8% U in 316 and 360° C. water was studied. Previous heat treatment has a large effect. The corrosion rate of quenched specimens is increased when sponge material is used instead of crystal bar. (R4, 2-14; Zr, *U*)

322-R. Symposium on Preservation for Mobilization Requirements. Naval Civil Engineering Research and Evaluation Laboratory. *U. S. Office of Technical Services,* PB 131007, Oct. 1956, 524 p. $8.

Forty papers covering a wide range of problems in the prevention of deterioration of such materials and equipment as vehicles, construction products, metals, engines, electrical devices and rubber. Preservative materials such as Teflon, organic coatings and liquid corrosion inhibitors are also dealt with. (R10)

323-R. Oxidation of Iron Oxides. F. Lecznar. *Hutnik,* v. 23, 1956, p. 413-418. (*Henry Brutcher Translation* no. 3948).

Reasons why Fe_3O_4 oxidizes during cooling to alpha Fe_2O_3 and not to gamma Fe_2O_3. Physicochemical properties of ferrous oxide. Physicochemical properties of Fe_3O_4 and of gamma Fe_2O_3. Oxidation of limonites contaminated with silica; influence of cooling time and cooling conditions; effect of reduction temperature; conditions under which the loss of iron can be held at a minimum. (R1h, Fe)

324-R. (French.) **Protecting Metals Against Corrosion.** Pierre Orlowski. *Génie Civil,* v. 134, May 15, 1957, p. 227-231.

Summary of corrosion problems and anticorrosion techniques. Mechanism of corrosion; protective methods, including cathodic coating; paints and varnishes; sprayed-on metallic coatings, electrodeposition; testing of anti-corrosive coatings. (R general, L general)

325-R. (Japanese.) **Effect of Halogen Ions on Anodic Passivation of Stainless Steels.** Susumu Moriden and Kazutaka Sakiyama. *Electrochemical Society of Japan, Journal,* v. 25, Apr. 1957, p. 191-195.

Investigation of passivity from the viewpoint of halogen ion concentration; anodic behavior of various stainless steels and metals in alkaline and acidic solutions. 5 ref. (R10c; SS)

326-R. (Japanese.) **Corrosion of Steel With Rough Surface.** Shunsuke Shishido. *Electrochemical Society of

Japan, Journal, v. 25, Apr. 1957, p. 187-191.

Corrosion study by electron diffraction; mechanism of corrosion; effect of inhomogeneity of base metal. 4 ref. (R1, R11a; ST)

327-R. (Japanese.) **Corrosion of Iron by Alternating Current.** Yutaka Torigoe. *Electrochemical Society of Japan, Journal,* v. 25, Apr. 1957, p. 203-208.

Corrosion of iron by alternating current in acid and salt baths; relation between corrosion rate and pH. 10 ref. (R1j; Fe)

328-R. (Polish.) **Influence of Mechanical Surface Treatment of Metals and Alloys Upon Their Corrosion Resistance.** Stanislaw Mrowec and Teodor Werber. *Hutnik,* v. 24, Apr. 1957, p. 142-147.

Influence of mechanical surface treatment upon the rate of oxidation of metallic surfaces. The differences of the rate of oxidation are due to variations in structure and chemical composition of the oxidized layer. Uniform interpretation of the phenomena involved cannot as yet be presented. 15 ref. (R1h, 3-20)

329-R. (Book.) **Corrosion and Wear Handbook for Water Cooled Reactors.** D. J. De Paul, Editor. Atomic Energy Commission TID 7006, Mar. 1957, 293 p. U. S. Government Printing Office, Washington 25, D. C. $2.25.

Engineering problems resulting from use of water as a heat transfer medium in a reactor plant. Presents in one reference source corrosion and wear data resulting from the development of the Nautilus submarine reactor and the Shippingport pressurized water reactor projects. Theoretical as well as experimental data on corrosion and wear of materials in water-cooled nuclear reactors are presented.
(R4, Q9n, W11p)

330-R. Controlled Moisture Condensation Apparatus for Evaluation of Rust-Preventive Oils. H. Roden. *ASTM Bulletin,* no. 223, July 1957, p. 55-61.

Test with closed cell, high-humidity, moisture condensation apparatus which provides specific temperature differences between humid ambient air and steel surface indicates test is fast and reproducible.
(R10b, R11)

331-R. Failure of Steel-Admiralty Duplex Condenser Tubes by Hydrogen Penetration. H. E. Honkala and E. A. Wright. *Corrosion,* v. 13, Aug. 1957, p. 501t-504t.

Tubes exposed to hydrogen sulphide and sufficient pressure between outer and inner tube to cause the liners to collapse, failed within four weeks. Pressure build-up rate of a "volumeless" cell in various corrosive atmospheres was studied. 8 ref. (R7k, T29n; ST, Cu)

332-R. Cathodic Protection of Oil Well Casings at Kettleman Hills, Calif. James K. Ballou and Fred W. Schremp. *Corrosion,* v. 13, Aug. 1957, p. 507t-514t.

Surface potential and casing potential profile measurements. Tests showed cathodic protection is a practical method to at least 8000-ft. depths, provided sufficient current is used. 13 ref. (R10d, T28)

333-R. Cathodic Protection of an Active Ship Using Zinc Anodes. B. H. Tytell and H. S. Preiser. *Corrosion,* v. 13, Aug. 1957, p. 515t-518t.

High-purity zinc conforming to MIL-A-18001 provided excellent protection. Hull potential readings both underway and at rest were obtained continually during the 15 months of investigation. Condition of tug's bottom was excellent and distribution of current was effective. 4 ref. (R10d, T22g; Zn, 17-7)

334-R. Some Aspects of the Corrosion Processes of Iron, Copper and Aluminum in Ethylene Glycol Coolant Fluids. P. F. Thompson and K. F. Lorking. *Corrosion,* v. 13, Aug. 1957, p. 531t-535t.

Effect on corrosion of iron, copper and alumnum of triethanolamine phosphate. Corrosion properties of the three metals in glycol and water-glycol mixtures are similar to those in pure water. 16 ref.
(R7; Fe, Cu, Al)

335-R. Chloride and Caustic Stress Corrosion of Austenitic Stainless Steel in Hot Water and Steam. W. Lee Williams. *Corrosion,* v. 13, Aug. 1957, p. 539t-545t.

Definition of environmental factors which govern stress-corrosion behavior in steam-water systems and possible means for control. 16 ref. (R1d, R4d; SS-e)

336-R. Nickel-Lined Steel Vessels for Caustic Service. J. L. Weis. *Industrial and Engineering Chemistry,* v. 49, June 1957, p. 69A-70A.

Restoration of cracked vessels. Problems in nickel lining procedure including lining thickness, welding, etc. (R6j; Ni)

337-R. Corrosion of Single Crystals and Recrystallized Single Crystals of Iron and Steel in Citric Acid. W. Roger Buck III, and Henry Leidheiser, Jr. *Electrochemical Society, Journal,* v. 104, Aug. 1957, p. 474-481.

Studies on polycrystalline disks and monocrystalline spheres and disks of Armco iron and type-L steel in 0.2N citric acid at 20° C. and boiling point. Results of seven different types of experiments indicate that the (100) face corrodes at a slower rate than minor faces such as (321). 15 ref. (R6g; Fe, ST, 14-11)

338-R. Corrosion and Cathodic Protection. H. V. Beezley and G. R. Olson. *Petroleum Engineer,* v. 29, June 1957, p. D28-D34.

Causes of corrosion, and control in pipeline systems by coatings, extra metal thickness and cathodic protection. Sources of electricity in cathodic protection. (R10d)

339-R. Accelerated Corrosion Tests for the Performance of Plated Coatings. Walter L. Pinner. *Plating,* v. 44, July 1957, p. 763-766.

Definition of acetic acid spray test and Corrodkote test for testing out-of-door durability of chromium plated steel and zinc alloy parts. (R11; *Cr,* 8-12)

340-R. Case Histroy on Cathodic Protection. *Steel,* v. 141, Aug. 12, 1957, p. 128-129.

Note on corrosion in underground piping systems and protection with anode and rectifier system. (R10d)

341-R. (French.) **Surface Flow Phenomena in the Course of High-Temperature Oxidation. The Case of Zirconium and Its Alloys.** D. Whitwham, J. Boghen and J. Hérenguel. *Revue de l'Aluminium,* v. 34, June 1957, p. 611-623. (CMA)

The oxidation of zirconium was studied in air in the temperature range 400-1050° C. for time intervals ranging up to 24 hr. It was found that below 500° C. a thin, compact oxide film adheres to and protects the metal. Above 500° C. the metal below the surface undergoes a real transformation due to the expansion which takes place during the conversion of the metal into its oxide. 9 ref. (R1h, 2-12; Zr)

342-R. (German.) **Electrochemical Processes in Stress-Corrosion.** H. Gerischer. *Werkstoffe und Korrosion,* v. 8, July 1957, p. 394-401.

The narrow localization of the corrosion process is caused by the mechanism of plastic deformation. Under plastic deformation the atoms on the lines of the slip planes or on slipping grain boundaries along the surface will be activated and dissolved favorably. As a result, protective coatings are formed on the surface of all alloys susceptible to stress-corrosion. Cracking of these covers under plastic deformation increases the localization of the corrosion process and causes the phenomenon of tension crack corrosion. 19 ref. (R1d, Q24)

343-R. (German.) **Description of the Corrosion Behavior of Aluminum and Its Alloys in Electrolytes by Means of Corrosion Current pH Value Diagram.** T. Markovic and M. Balasa. *Werkstoffe und Korrosion,* v. 8, July 1957, p. 402-405.

The corrosion currents of 99.5% pure aluminum and the aluminum alloys with 0.69, 1.6, 4.6% Mg. were calculated from the discontinuities of the anodic and cathodic polarization curves with initial pH values known and were transferred into the customary corrosion equivalent of g. per sq. m. per day. 19 ref. (R11m; Al)

344-R. (Japanese.) **Corrosion and Prevention of Corrosion.** *Electrochemical Society of Japan, Journal,* v. 24, Dec. 1956, p. 619-624.

Theory and mechanism of corrosion, dry corrosion and the phenomenon of passivation; examples of prevention of cathodic corrosion; corrosion tests and corrosion inhibitors. (R10, R11)

345-R. (Japanese.) **Corrosion of Metals in Atomic Reactors.** Goro Ito. *Electrochemical Society of Japan, Journal,* v. 25, Apr. 1957, p. 148-156.

Corrosion of metals by high-temperature water in atomic reactors; corrosion resistance of stainless steel, zirconium-tin alloys and carbon steel; corrosive effects of uranium, uranium salts, molten metals and bismuth. 35 ref.
(R general, W11p, 17-7)

346-R. Prevention of Corrosive Cracking of Brass Liquid Fuel Manifolds. A. V. Shreider. *Journal of Applied Chemistry of the USSR,* v. 29,

July 1956, p. 1133-1142. (Translated by Consultants Bureau, Inc.)

Cause of corrosive cracking; effectiveness of cadmium plating; comparison of brass versus cupronickel manifolds. 28 ref.
(R1d; Cu-n, *Cd*)

347-R. Processes of Film Formation and Destruction in Cathodic Protection of Steel in Sea Water. I. B. Ulanovsky. *Journal of Applied Chemistry of the USSR,* v. 29, July 1956, p. 1143-1148. (Translated by Consultants Bureau, Inc.)

Chemical composition of cathodic films and solubility product of components; conditions for equilibrium between precipitates and sea water. 13 ref. (R4b, R10d; ST)

348-R. Anti-Corrosion Treatment of Zinc Coatings. N. A. Solovyer. *Journal of Applied Chemistry in the USSR,* v. 29, July 1956, p. 1149-1152. (Translated by Consultants Bureau, Inc.)

Treatment of zinc-coated surfaces in a solution of chromic, sulphuric and hydrochloric acids produced 8 to 10-fold increase in corrosion resistance, as shown by corrosion chamber tests, prolonged storage and factory trials. 4 ref. (R10c; *Zn,* 8)

349-R. Passivity of Titanium in Hydrochloric Acid Solution. R. Otsuka. *Tokyo, Scientific Research Institute, Journal,* v. 51, June 1957, p. 73-74. (CMA)

The passivity of titanium in hydrochloric acid solutions is attributed to hydride formation which is passivated on exposure to air. The passive state thus obtained was unstable but could be insured by immersion in nitric acid solution. Potassium chloride solution was also helpful. The corrosion loss difference between passivated and unpassivated specimens corresponds to the times required to destroy the passivity of titanium and TiH. The passive state on the latter is the more stable. (R10c; Ti)

350-R. Report of the May 1954 Meeting of the Zirconium Alloy Corrosion Committee. S. Kass. *U. S. Atomic Energy Commission,* WAPD-MM-448, June 1, 1954, 115 p. (CMA)

Results of research by member organizations on Zircaloy-3 development, feasibility of less tin in Zircaloy-2, effects of varying iron and nitrogen in Zircaloy-2, effects of cold reduction and annealing on zirconium corrosion resistance and plans for future research.
(R general; Zr)

351-R. Aqueous Corrosion of Zirconium and Its Alloys At Elevated Temperatures. D. E. Thomas. *U. S. Atomic Energy Commission,* WAPD-T-254, 20 p. (CMA)

A study of the kinetics of zirconium corrosion in hot water resulted in an empirical relationship between weight gain per area and a power of time (0.5-1.0). The effect of temperature shows itself in the size of the time coefficient. The effects of impurities are mainly harmful, this being true of nitrogen especially. Alloying to overcome "breakaway" was studied. Tin is the best addition for overcoming impurity effects. The Zircaloy-2 composition is considered very favorably. 11 ref. (R4, 2-12; Zr)

352-R. Corrosion Evaluation of Binary Uranium Alloys in Water at 100° C. H. A. Saller, H. A. Pray, R. F. Dickerson, W. E. Berry and E. L. Foster, Jr. Battelle Memorial Institute, *U. S. Atomic Energy Commission,* BMI-971, Dec. 27, 1954, 37 p.

Additions ranging from 2 to 12 at. % of some 42 elements and effect of heat treatment on corrosion resistance were investigated. Melting characteristics, fabrication temperatures, and heat treatment temperatures for each alloy were noted. Vickers hardness numbers of all alloys and data on grain size of the more corrosion resistant alloys were also obtained. 17 ref.
(R4, 2-12, 2-10, 2-14; U)

353-R. Crevice Corrosion of Uranium and Uranium Alloys. J. W. Frank and A. H. Roebuck. Argonne National Laboratory, *U. S. Atomic Energy Commission,* ANL-5380, Mar. 1955, 390 p.

Corrosion of uranium in high-temperature (500° F.) water; capsule experiments, bonded plate-pinhole experiments and gaseous hydriding experiments are described. 17 ref. (R1b, R4, 2-12; U)

354-R. Corrosion of Materials in the Presence of Fluorine at Elevated Temperatures. M. J. Steindler and R. C. Vogel. Argonne National Laboratory, *U. S. Atomic Energy Commission,* ANL-5662, Jan. 1957, 21 p.

Data indicated that nickel and Monel were suitable materials for use in a fluorine atmosphere at tem-

peratures up to 550° C. At higher temperatures nickel and copper exhibited the lowest corrosion rates. Ceramic materials such as calcium fluoride and alumina were resistant to attack by fluorine even at the highest temperatures, but lacked mechanical strength. (R6, 2-12)

355-R. Corrosion of Aluminum in High-Temperature Water. Pt. 2. Application of Infrared Spectra to Corrosion Studies. R. M. Haag. General Electric Co., *U. S. Atomic Energy Commission*, KAPL-1739, Feb. 28, 1957, 19 p. (Available from U. S. Office of Technical Services, $.20.)

The application of infrared transmission measurements to corrosion studies has been investigated. Corrosion products may be identified in situ by reflectance measurements, or after removal from the base metal. (R4, 2-12; Al)

356-R. Corrosion Properties of Various Materials in High-Temperature Waters. C. J. Lancaster and W. L. Williams. Naval Engineering Experiment Station. *U. S. Office of Technical Services*, PB 111963, Jan. 1953, 22 p. 75¢.

Prestressed Inconel and Type-302 stainless steel coil springs and prestressed Type-347 steel showed no evidence of intergranular or stress-corrosion failure when tested in 500° degassed distilled water and 470° F. synthetic boiler feed water, respectively. On the other hand, dynamic stress-corrosion tests on chromium plated K-Monel, Armco 17-14, 17-4, SS-310, 322 and 347 stainless steels, 90-10 and 70-30 copper-nickel alloys, Easy-Flo silver brazing alloy on Type 304 steel, and Navy No. 2 babbitt indicated varying degrees of corrosion in 500° F. oxygenated water. (R4, 2-12; SS)

357-R. Investigation of Intergranular Oxidation in Stainless Steels and High-Nickel Alloys. C. A. Siebert, et al. University of Michigan. (Wright Air Development Center.) *U. S. Office of Technical Services*, PB 121795, Oct. 1956, 53 p. $1.50.

With some alloys, oxidation occurs in the grain boundaries ahead of the metal-oxide interface. In tests, intergranular penetrations increased rapidly with stress after a certain minimum value was reached. This minimum value, or threshold stress, was determined for several alloys at various temperatures, along with the weight gained during oxidation. Among the results, it was found that most of the alloys followed the parabolic oxidation law. (R1h; SS, Ni)

358-R. Effect of Structure of Lead Upon Its Corrosion in Sulphuric Acid. M. A. Dasoyan. *Doklady Akademii Nauk SSSR*, v. 107, no. 6, 1956, p. 863-866. (*Henry Brutcher Translation* no. 3940.)

Previously abstracted from original. See item 345-R, 1956. (R6g; Pb)

359-R. (German.) **Study of Oxide Layers on Cast Iron and Aluminium.** Anton Königer. *Giesserei*, v. 44, Aug. 1, 1957, p. 457-461.

Examination of the effect of the skin or oxide scale on the mechanism of corrosion; gases as the source of swelling within the skin; effect of local corrosion at the surface on the formation of blowholes; prerequisites of the formation of a dense oxide skin; fundamental differences in the corrosion behavior of cast iron and aluminum. 6 ref. (R1h; CI, Al)

360-R. (Italian.) **Some Aspects of Hull Corrosion in Vessels Under Construction.** Biaggio Ruggiero. *Rivista Italiana della Saldatura*, v. 9, Mar-Apr. 1957, p. 69-72.

Electrochemical phenomena which cause hull corrosion, especially those originating in on-board welding operations performed with d.c. and basic electrodes, or with electrode connected to positive pole of generator; recommended precautions with reference to working conditions, welding equipment and mooring of vessels. (R1j, K1, T22g)

361-R. (Italian.) **Corrosion in a Marine Atmosphere.** Giampaolo Bolognesi. *Rivista di Meccanica*, no. 159, Apr. 13, 1957, p. 13-16.

Special problems of large installations where frequent anticorrosion treatments are costly or otherwise not readily executed; case of specialized installations, such as oil company docks, where marine medium is altered by other substances. Pitting, effect of scale left by rolling operations, corrosion effects of tide and mud, corrosion of welded parts. (R4b, R3p)

362-R. (Japanese.) **Corrosion of Cast Iron by Sulphur.** Yoh Serita. *Casting Institute of Japan, Journal*, v. 29, Apr. 1957, p. 257-258.

Prevention of corrosion by sulphur by adding chromium, manganese,

vanadium and aluminum to cast iron.
(R7k, 2-10; CI-q, *Cr, Mn, V, Al*)

363-R. (Japanese.) **Corrosion of Chemically Polished Stainless Steel.** Maro. *Chemical Society of Japan, Journal,* v. 60, June 1957, p. 680-683.

Corrosion tests on electrically polished, chemically polished and mechanically polished stainless steel. Corrosion was greatest in the electrically polished samples.
(R general, L10b, L12f, L13p; SS)

364-R. Corrosion Resistance of Metals and Alloys to Sodium and Lithium. E. E. Hoffman and W. D. Manly. Paper "Symposium on Handling and Uses of the Alkali Metals." American Chemical Society, p. 82-91.

Comparison of the corrosion resistance of various metals and alloys in these liquid metals at elevated temperatures. The principal variables which affect the extent and form of corrosion are temperature, time, temperature differentials in the system, and purity of the liquid metal. 5 ref.
(R6m, 2-11; *Na, Li*)

365-R. Intergranular Corosion Resistance of Low-Carbon Austentic Chromium - Manganese - Nickel Steels. W. O. Binder, J. Thompson and C. R. Bishop. *American Society for Testing Materials, Proceedings,* v. 56, 1956, p. 903-922.

The austenitic chromium-manganese-nickel steels become susceptible to intergranular corrosion when heated in the temperature range of 425 to 815° C. The immunization of these steels with columbium or titanium introduces metallurgical complications, and in view of this, the possibility of gaining control of intergranular corrosion by lowering carbon was investigated. 4 ref.
(R2h, 2-10; SS)

366-R. Corrosion of Metals in Buildings. F. E. Jones. *Chemistry and Industry,* v. 76, Aug. 3, 1957, p. 1050-1063.

Service conditions described and applications of lead, copper, zinc and aluminum enumerated. 11 ref.
(R3, T26n, 17-7; Pb, Cu, Zn, Al)

367-R. Corrosion in Light Oil Storage Tanks. E. H. Tandy. *Corrosion,* v. 13, July 1957, p. 427t-432t.

Factors governing corrosion rates in steel storage tanks are solubility of oxygen in oil, rate of movement of oil, type of roof, vapor pressure and climatic conditions; data on relationship between size, location of tanks, stocks contained and corrosion rate; considers corrosion mechanism and control measures. 9 ref.
(R7e; ST)

368-R. Corrosion of Iron in High-Temperature Water. Pt. 2. Kirkendall Experiments. D. L. Douglas and F. C. Zyzes. *Corrosion,* v. 13, July 1957, p. 433t-436t.

Kirkendall type of experiments using an oxide of radioactive nickel as marker carried out to identify ion species diffusing through magnetite film formed on corrosion of iron in water with temperature range of 240 to 360° C.; evidence indicates diffusion of iron ion outward from metal to water interface. 8 ref.
(R4, 2-12; Fe)

369-R. Cathodic Protection of Internals of Ships. L. P. Sudrabin. *Corrosion,* v. 13, July 1957, p. 466t-472t.

In formation on cathodic protection of internal steel tanks used for sea water ballast including design and application of protective current and protection achieved with magnesium anodes. 11 ref.
(R10d; ST)

370-R. Progress in Prevention of Corrosion in Naval Aircraft. S. L. Chisholm and N. N. Rudd. *Corrosion,* v. 13, July 1957, p. 473t-480t.

Techniques developed by Navy for long-time protection of aircraft components; protection of magnesium alloys with pigmented silicone, resin coatings, and results obtained with thixotropic preservation formulations and vapor inhibitors in preventing cylinder wall corrosion in reconditioned aircraft engines. 29 ref. (R10b, L general, T24b)

371-R. Performance of Alcan 65S-T6 Aluminum Alloy Embedded in Certain Woods Under Marine Conditions. T. E. Wright, H. P. Godard and I. H. Jenks. *Corrosion,* v. 13, July 1957, p. 481t-487t.

Laboratory and marine exposure tests carried out to assess performance of Alcan 65S-T6 aluminum alloy embedded in certain woods under marine exposure conditions. 3 ref.
(R4b; Al)

372-R. Science of Corrosion. J. M. Kape. *Corrosion Prevention and Control,* v. 4, July 1957, p. 37-41, 52.

Review of fundamental chemical changes and reactions occurring at anode and cathode of corrosion cells. 14 ref. (R1)

373-R. Corrosion Research—Corrosion of Metals Group of the Chemical Research Laboratory. *Corrosion Prevention and Control,* v. 4, July 1957, p. 49-52.

Measuring chromium uptake on steel specimens immersed in chromate solution containing radioactive chromium ions; electrode potential of various metals in solutions of ethylene glycol and other corrosion inhibitors; influence of copper content and pH of water on pitting in mild steel boiler tubes. 4 ref. (R11, A9h; ST)

374-R. Corrosion and Iron Oxide Deposition Associated With Steam Power Stations. *Edison Electric Institute Bulletin,* v. 25, May 1957, p. 147-148.

Battelle research program determining solubility product and rate of decomposition of ferrous hydroxide over a range of temperatures and calculation of free energies and heats of reactions involved in corrosion. (R4d; ST)

375-R. Kesternich Corrosion Test. *Electroplating and Metal Finishing,* v. 10, May 1957, p. 157.

Note on rapid test developed in Germany for measuring accelerated corrosion by atmosphere. (R11q)

376-R. Researches on Corrosion and Inhibition Adsorption, Inhibition and the Langmuir Equation. George S. Gardner. *Franklin Institute, Journal,* v. 263, June 1957, p. 523-535.

Corrosion velocity of steel in dilute acetic acid, in the presence of an oil phase, and in the presence and absence of an organic inhibitor. 7 ref. (R1, R10b; ST)

377-R. Events at a Scratch-Line. Fourth Hothersall Memorial Lecture. U. R. Evans. *Institute of Metal Finishing, Bulletin,* v. 7, no. 2, Summer 1957, p. 139-166.

Effects of scratches in metal surfaces on corrosion; reviews information on iron, nickel, zinc, aluminum, titanium, and zirconium. Data on probability of corrosion at scratch-line with relationships to period of air exposure, proximity of neighboring scratch, electrical current flowing between scratch and surrounding region and internal stresses formed by scratching; considers stress situation on metals oxidized by inward movement of oxygen through film and those oxidized by outward movement of metal ions. 34 ref. (R1d, R1j; Fe, Ni, Zn, Al, Ti, Zr)

378-R. Cathodic Protection in Relation to Ships' Bottom Paints. H. W. Van der Hoeven. *Oil and Colour Chemists' Assoc. Journal,* v. 40, Aug. 1957, p. 667-683.

Behavior of ships' hull paint systems under cathodic protective conditions. Best results obtained with vinyls or with coated anodes shaped to expose increasing anode surface. 13 ref. (R10d, T22g; 8-20)

379-R. How to Combat Corrosion From High-Sulphur Residual Fuel Oils. J. L. Philips and C. A. Weisel. *Marine Engineering Log,* v. 62, June 1957, p. 93-94, 166.

Cylinder lubricant for marine diesel engines which reduces cylinder wear and neutralizes sulphurous combustion products, thereby reducing corrosion. (R7d)

380-R. Rust. *Railway Age,* v. 143, Aug. 19, 1957, p. 18-22.

Use of corrosion resistant materials and paint. (R general, T23, 17-7; L26n)

381-R. (French.) **Corrosion of Lead Casings of Underground Electric Cables.** J. C. Senez and F. Pichinoty. *Corrosion et Anticorrosion,* v. 5, July-Aug. 1957, p. 203-209.

Tests on cables, some of which had been buried for long periods, others of which were still in warehouses, showed that white corrosion of lead casings was caused by attack of volatile fatty acids present in the form of esters in raw jute used to pack cables. These esters result from incomplete retting of the jute fibers and are hydrolyzed by pectinolytic bacteria. A sample of cable with paper packing instead of jute revealed no corrosion. 11 ref. (R8, T1b, 17-7; Pb)

382-R. (French.) **Influence of Inhibitors on Ratio Between Adsorbed Hydrogen and Released Hydrogen in Corrosion of Iron in an Acid Medium.** Giampaolo Bolognesi and Liliana Felloni. *Corrosion et Anticorrosion,* v. 5, July-Aug. 1957, p. 210-215.

Action of three typical inhibitors (OTT, ISOT, PTOL) on speed of dissolution of Armco iron in HCl was studied by gasometric measurement of released hydrogen and

colorimetric measurement of iron in solution. Since quantity of adsorbed hydrogen was quite large, measurements of volume of released hydrogen could not provide a precise evaluation of inhibiting power, particularly when readings were made after a brief delay. Choice of an inhibitor should depend largely on quantity of adsorbed oxygen. 19 ref. (R10b, R6g; Fe, *H*)

383-R. (French.) **Corrosion Protection for Industrial Steam Producing and Utilizing Installations. Pt. 2. How to Guarantee Protection of Equipment.** R. Malicet. *Corrosion et Anticorrosion,* v. 5, July-Aug. 1957, p. 216-220.

Types of corrosion encountered in different elements of steam installations; supply water and boiler water make-up, rate of vaporization and generator design as factors causing internal corrosion of piping; importance of correct operation of steam equipment by qualified personnel. (R4d)

384-R. (French.) **Report of Work of Commission on Marine Corrosion of A.B.E.M. (Belgian Society for Study, Testing and Use of Materials.)** J. Depireux. *Industrie Chimique Belge,* v. 22, Apr. 1957, p. 379-392.

Specimens of steel were immersed for 16 months in Port of Ostend prior to tests designed to show: (1) influence of surface conditions on behavior of a typical paint applied with or without wash-primer; (2) influence of time elapsing between application of wash-primer and of paint; (3) behavior of different wash-primers for a given prepared surface and a given paint. (R4b; ST, 8-20)

385-R. (Italian.) **Influence of Surface Preparation of Steel on Behavior of High Zinc Content Paints.** G. Binetti and G. C. Ghisolfi. *Metallurgia Italiana,* v. 49, May 1957, p. 327-332.

Electrochemical nature of iron corrosion; zinc as an anodic inhibitor; removal of mill scale; prepainting of surfaces. Experiments and results. (R10b, L26n; ST, 8-20)

386-R. (Italian.) **Sodium Polyphosphates and Their Use as Corrosion Inhibitors.** A. Indelli. *Metallurgia Italiana,* v. 49, May 1957, p. 33-336.

Physical properties and characteristics of sodium phosphates; description of their operation to prevent corrosion. Attempt at logical and coherent interpretation of their inhibiting action can be made on basis of different possible types of cathodic corrosion reaction and of surface activity characteristics of the compounds derived from these salts. 33 ref. (R10b)

387-R. (Italian.) **Control of Bituminous Coverings of Pipe Destined for Underground Installation.** F. Baldi. *Metallurgia Italiana,* v. 49, May 1957, p. 337-340.

Details of conductometric test adopted at "Centro Ricerche e Controlli Falck"; actual service conditions of pipe are duplicated in tests to determine covering requirements to prevent corrosion, especially that resulting from stray electric currents. Test method has application in production process. 33 ref. (R8, L26a; 4-10)

388-R. (Italian.) **Thermal Balance Used for Oxidation Tests on Cast Irons Containing Al and Cr.** N. Collari and E. Hugony. *Metallurgia Italiana,* v. 49, May 1957, p. 341-348.

Test pieces were heated in air at 800° C. for as long as 3 hr. In normal or low-alloy cast irons, white Al-Cr cast iron, and a heat resistant chromium steel which was tested for purposes of comparison, an increase in weight was noted. In gray (graphitic) cast irons containing aluminum, a decrease in weight was noted, due to surface oxidation of carbon. Aluminum, under given test conditions, provided a higher resistance to heat than chromium. 9 ref. (R1h, 1-4; CI-q, *Al, Cr*)

389-R. (Italian.) **Some Inhibitors of Aluminum Corrosion. Pt. 1. Acid Medium in Presence of Tannic Acid and Rosin.** G. DeAngelis and V. Carunchio. *Metallurgia Italiana,* v. 49, May 1957, p. 349-354.

Specimens of 99% aluminum were immersed in hydrochloric acid. Both tannic acid and rosin showed good inhibiting properties, providing about 99% protection in strongest solutions. Study was carried out by measuring loss of weight, reaction potential, surface tension and pH. 31 ref. (R10b, R6g; Al)

390-R. (Italian.) **Oxidation Behavior of Metals and Alloys in the Molten State.** P. Spinedi. *Metallurgia Italiana,* v. 49, May 1957, p. 363-370.

Lead, cadmium, tin and zinc were subjected to hot oxidation; behavior

in both solid and liquid phases was studied, with emphasis on latter. Binary alloys of these metals were then studied to determine influence exerted on their oxidation behavior by varying concentrations of components. Simple eutectic diagrams, were studied, as well as influence on oxidation behavior of intermetallic compounds (cadmium-copper diagram) and by superlattices (cadmium-magnesium diagram). Analogies between oxidation - concentration curves obtained and those reported in recent studies on viscosity, castability, surface tension, etc., in relation to concentration. 40 ref. (R1h, 2-10; Pb, Cd, Sn, Zn, 14-10)

391-R. (Italian.) **Iron Corrosion and Boiler Water Treatment.** T. Songa. *Metallurgia Italiana,* v. 49, May 1957, p. 371-376.

Corrosion of iron in aqueous media; formation of a protective layer on iron by action of boiling water; influence of oxygen and alkalis; problem of copper in boiler water; caustic corrosion in boilers; corrosion preventives as established by experiments at Breda Institute, specialists in water treatment. 30 ref. (R4c, R10a; Fe)

392-R. (Japanese.) **Corrosion Fatigue of Steel Wire.** Endo Kichiro, Hiroyasu Huji and Shunji Omori. *Japan Society of Mechanical Engineers, Transactions,* v. 23, July 1957, p. 484-488.

Corrosion fatigue of 0.75% carbon steel, annealed and cold worked, in relation to residual stress. (R1e, Q25h, CN, 4-11)

393-R. (Polish.) **Anodic Behavior of Metals. Pt. 4. Copper in NaOH Solutions.** Zdzislaw Zembura. *Roczniki Chemii,* v. 31, no. 2, 1957, p. 627-635.

An attempt to elucidate the mechanism of passivation of copper in NaOH solutions, based chiefly on the analysis of the curves of the ratio between the anodic current density and the anode potential during voltage controlled electrolysis. 9 ref. (R10c; Cu)

394-R. Erosion of Aluminum. E. H. Honeycutt, Jr. E. I. du Pont de Nemours & Co., *U. S. Atomic Energy Commission,* DP-214, May 1957, 16 p.

Specimens of aluminum were undamaged or eroded only slightly during two months of exposure to deionized water at velocities up to 125 ft. per sec. (R4; Al)

395-R. Reaction of Steam With Uranium and With Various Uranium-Niobium-Zirconium Alloys at High Temperatures. Alexis W. Lemmon, Jr. Battelle Memorial Institute, *U. S. Atomic Energy Commission,* BMI-1192, June 17, 1957, 74 p.

Measurement of metal-water reaction rates, and emissivity determinations. 13 ref. (R4d; U)

396-R. (French.) **Research on the Oxidation Mechanism of Single Crystals of Iron at High Temperature and Under Low Oxygen Pressure.** Jean Bardolle. *Ministere de l'Air, Publications Scientifiques et Techniques,* Paris, no. 327, 62 p.

Preparations and experimental methods; aspects of oxidation of iron under different pressure and temperature conditions; phenomena of germination of iron oxide at 850° C. under very low oxygen pressure; orientation relationship between iron and ferrous oxide; general interpretations. 35 ref. (R1h; Fe, 14-11)

397-R. (French.) **Behavior of Nickel and Nickel Alloys in the Presence of Halogens.** L. Arbellot. *Revue du Nickel,* v. 23, Apr-May-June 1957, p. 45-51.

Effect of chlorine and hydrochloric acid on nickel, Monel and Inconel. (R6g; Ni)

398-R. (German.) **Demonstration of the Thixotropic Protective Layer on Metal.** Rikuro Otsuka. *Kolloid Zeitschrift,* v. 153, July 1957, p. 59. (CMA)

The formation of a thixotropic protective layer on pure titanium (99.3% by weight) was demonstrated by an experiment in which titanium sheet metal electrodes were immersed in 0.10 *N* aqueous potassium chloride. Simultaneous pitting and the formation of white, colloidal titanium oxide hydrate are observed on the application of 12 volts at the electrodes. 3 ref. (R2q; Ti)

399-R. (Italian.) **Anodic Corrosion of Iron in Reinforced Concrete.** Mario Maraghini and Cesare Ginnari. *Ricerca Scientifica,* v. 27, May 1957, p. 1500-1508.

Iron bars were coated with different types of cement mortar and seasoned 7 to 9 months. Spontaneous corrosion during seasoning was slight and did not interfere with results of tests for anodic corrosion. Variations in quantity of electricity passed through specimens caused marked differences in corrosion, pos-

sibly due to nature of cements and presence of chlorides. Variations of current density caused a minimum of variation in corrosion, suggesting a relationship between protective action of cement and its capacity to oppose local variations of pH. Measurement of difference of potential applied to system in function of time permitted determination of phenomena accompanying cracking of cement coatings.
(R6q; Fe, NM-f43)

400-R. (Book.) **Underground Corrosion.** Melvin Romanoff. National Bureau of Standards Circular 579, Apr. 1957. 227 p. $3.

Final report on studies conducted by the National Bureau of Standards from 1910 to 1955. In a field burial program more than 36,500 specimens, representing 333 varieties of ferrous, nonferrous and protective coating materials were exposed in 128 test locations throughout the United States. Electrical and electrochemical aspects of underground corrosion were studied in laboratory. Results of field and laboratory investigations are presented. 407 ref. (R8, 1-4)

401-R. Defect Test on U-2°/o Zr Alloy in the X-2 Loop. R. F. S. Robertson. *Atomic Energy of Canada, Ltd.*, CRDC-647, May 1957, 21 p. (CMA)

A sample of 2% Zr uranium sheather in Zircaloy-2 was subjected to a flow of 550° F. water in a reactor flux. A 0.010-in. hole was defected through the sheath. The resulting sequence of events is described. 2 ref.
(R4, T11p, 17-7; U, *Zr*)

402-R. Low-Nickel Stainless Steels. J. G. Henderson. *Chemical Engineering Progress,* v. 53, Aug. 1957, p. 82, 84.

Information on testing program being conducted in chemical industry on corrosion of Type 202.
(R general, R11; SS)

403-R. Corrosion of Metals in Buildings. J. C. Hudson and F. Wormwell. *Chemistry and Industry,* v. 76, Aug. 10, 1957, p. 1077-1089.

A large number of cases of corrosion of ferrous metals are discussed and corrective measures proposed. 12 ref.
(R3, T226n, 17-7; ST)

404-R. Contributions to the Study of Internal Corrosion. J. Morlet and C. Geoffray. *Gas Journal,* v. 291, Aug. 14, 1957, p. 332-334.

Corrosion of steel mains and pipes by synthetic gases, made up from nitrogen, carbon dioxide and oxygen, with or without water, compared with town gas, under different pressures. Suggested control, including limiting oxygen content and dehydration.
(R6p, R6q; ST, EG-m44, 4-10)

405-R. Stress Corrosion of Austenitic Stainless Steel in Steam and Hot-Water Systems. C. Edeleanu and P. P. Snowden. *Iron and Steel Institute, Journal,* v. 186, Aug. 1957, p. 406-422.

Investigation of conditions under which stress-corrosion and cracking occur in austenitic stainless steels in steam and hot water. Effects of temperature, pressure and contamination with chloride or hydroxide ions. 8 ref. (R1d, R4d; SS)

406-R. Corrosion Resistance of No. 20 and No. 20Cb Stainless Steel Welds. Hallock C. Campbell, Thomas J. Moore and S. E. Tyson. *Welding Journal,* v. 36, p. 353s-359s.

Investigation of comparative corrosive behavior of No. 20 stainless weld metal and No. 20 stabilized with columbium in several conditions of heat treatment; analyzes susceptibility to weld cracking and intergranular corrosive attacks.
(R general, R10c; SS, 7-1)

407-R. Stress Corrosion of Titanium Weldments. Russel Meredith and W. L. Arter. *Welding Journal,* v. 36, Sept. 1957, p. 415s-418s. (CMA)

The cause of weld cracking at high temperature in a resistance and fusion-welded tank of RC-A110AT was investigated. Physical testing included hydrostatic pressure testing and tension-compression loading parallel to the longitudinal axis at 270° F., and hydrostatic testing at 700° F. using a chlorinated hydrocarbon as a pressurizing medium. In the latter test numerous transverse weld cracks developed in both kinds of welds. The cause was attributed to free HCl in the hydrocarbon, although the mechanism is uncertain. (R1d; Ti, 7-1)

408-R. (English.) **Studies on Corrosion Resistance of Titanium Alloys. Pt. III. Corrosion Resistance of Ti-Ag, Ti-Cu, Ti-Fe, Ti-Co, Ti-W and Ti-Sn Alloys.** Susumu Yoshida, Shigetake Okamoto and Takashi Araki. *Gov-*

ernment Mechanical Laboratory, Journal, v. 3, no. 1, 1957, p. 56-58. (CMA) (Also in *Journal of Mechanical Laboratory,* v. 11, May 1957, p. 87-93—Japanese.)

Arc-melted, hot and cold rolled specimens of a number of binary titanium alloys were tested in 25° C. and boiling test solutions. Graphs show the corrosion resistance of the alloys in H_2SO_4, HCl, HNO_3, aqua regia, oxalic acid, other organic acids, $FeCl_3$ and $AlCl_3$. (R6g; Ti)

409-R. (French.) **Tarnishing of Metals.** P. Huyskens. *Industrie Chimique Belge,* v. 21, Nov. 1956, p. 1171-1192.

Experimental study of kinetics of tarnishing; principal kinetic laws; migration of defects in ionic network; electrical conductivity of products of tarnishing; theories of tarnishing; orientation of crystalline faces; study of phases; oxidation, halogenation; sulphurization. 87 ref. (R2r)

410-R. (German.) **Testing of Welded and Nonwelded Austenitic Chromium-Nickel Steels for Intercrystalline Corrosion.** Herbert Zitter. *Archiv für das Eisenhüttenwesen,* v. 28, July 1957, p. 401-416.

Different testing methods for intercrystalline corrosion are compared critically and the isothermal curves of precipitation of carbides at grain boundaries are given. Testing in a solution of hydrofluoric acid and nitric acid lends itself particularly to the testing of welded samples. A mixture of copper sulphate and sulphuric acid is preferable for nonwelded steel. It is shown that the susceptibility of steel to intercrystalline corrosion depends on the welding method, the welding speed and some other factors. Relations between time and temperature are described mathematically. 65 ref. (R2h, R11h; AY, *Cr, Ni,* 7-1)

411-R. (Italian.) **Corrosion of Puddled Iron.** Nello Collari. *Calore,* v. 28, April 1957, p. 147-153.

Structure of puddle iron; probability and speed of corrosion; possibilities of using new knowledge to produce a less expensive product than puddled iron, but one that will retain its valuable characteristics. 7 ref. (R general; Fe)

412-R. (Italian.) **Corroded Al-Mg Alloy Rivets.** E. Hugony. *Rivista di Meccanica,* no. 162, May 25, 1957, p. 15.

Study of rivets used in naval construction showed corrosion to be intercrystalline; causes were excessive magnesium content (6%) and degree of hardening of the material. Remedies suggested are use of rivets made of 3.5% Mg alloy and annealing of rivets at about 360° C. after fabrication. (R2h, T7f, 17-7; Al, *Mg*)

413-R. (Japanese.) **Study on the Oxidation in Air of Titanium and Its Alloys.** Shiro Ogawa, et al. *Japan Institute of Metals,* v. 21, June 1957, p. 410-414. (CMA)

Weight increases of titanium alloyed with 3-10% Al or 0.3-1.5% Si on exposure to air at 700-800° C. showed that a simple parabolic law was not in operation and that the additions had a slight suppressant action, especially at lower temperatures. Surfaces oxidized at 400-700° C. showed anatase and rutile forms, but those oxidized at 800-1000° C. showed only rutile. Two orientations of rutile were seen at 700-900° C. 11 ref. (R1h; Ti)

414-R. (Norwegian.) **High-Temperature Oxidation of Metals and Alloys.** Per Kofstad. *Teknisk Ukeblad,* v. 104, no. 12, Mar. 21, 1957, p. 225-230.

Mechanics of metal oxidation; Wagner's oxidation theory; oxidation of metals with an electron conducting layer of oxide; formation of several layers of oxide; oxidation of copper and iron.
(R1h, 2-12; Cu, Fe)

415-R. (Spanish.) **Corrosion of Iron by Sulphate Reducing Bacteria in the Mineral Baths at San Diego de los Banos in Pinar del Rio.** Juan Embil Bollada. *Revista Farmaceutica de Cuba,* v. 35, May 1957, p. 239-242.

Corrosion of piping and other iron items was due to action of vibrio-type bacteria and occurred in two forms: as a result of action of hydrosulphuric acid, and anaerobic corrosion, the latter being more serious. Electrochemical protection of iron elements in contact with waters avails little against anaerobic corrosion. Solution is to use glass or plastic in place of iron. (R1g; Fe)

416-R. **Effect of Oxide Recrystallization on the Oxidation Kinetics of a 62:38 Copper-Nickel Alloy.** J. A. Sartell, S. Bendel, T. L. Johnston and C. H. Li. *American Society for Metals, Transactions,* v. 50, Preprint no. 47, 1957, 24 p.

During isothermal oxidation, two oxide layers are formed; an outer cubic oxide layer whose growth is described by a single parabolic law and an inner layer, consisting of a mixture of cuprous oxide and nickel monoxide, whose growth is described by two consecutive parabolic laws. 12 ref. (R1h, Cu, Ni)

417-R. Influence of Nickel on Intergranular Corrosion of 18% Chromium Steels. J. R. Upp, F. H. Beck and M. G. Fontana. *American Society for Metals, Transactions,* v. 50, Preprint no. 51, 1957, 18 p.

Alloys containing intermediate nickel compositions were cast, rolled, heat treated and tested to determine the influence of this element on corrosion behavior. It was found that the transition occurs at about 2.5 to 3% nickel. Steels with higher nickel should be heat treated like the austenitic steels and those below like the ferritic steels. An unexpected result was the good resistance to intergranular corrosion of all of these alloys when water quenched from 1400° F. 8 ref. (R2h, 2-10; SS, Cr, Ni)

418-R. Corrosion Resistance of Titanium to Sea Water. J. B. Cotton and B. P. Downing. *Institute of Marine Engineers, Transactions,* v. 69, Aug. 1957, p. 311-319. (CMA)

The protective role of titanium surface films was demonstrated with electrode potential measurements. Resistance is high to flowing steam and to flowing seawater transporting abrasive matter. Crevice attack of titanium is insignificant. Galvanic behavior of titanium coupled with numerous other metals is reported. 20 ref. (R4b; Ti)

419-R. (Czech.) **Oxidation of Steels in Superheated Steam.** Pavel Gröbner and Zdenek Bret. *Hutnicke Listy,* v. 12, no. 2, 1957, p. 125-131.

Experiments demonstrate that it is possible to apply Wagner theory on iron and steel oxidation in superheated steam with sufficient exactness for practical purposes. 23 ref. (R4d, R2h; ST)

420-R. (French.) **Contribution to the Study of Corrosion of Aluminum in an Alkaline Medium.** Helmy Makram. *Comptes Rendus,* v. 244, June 24, 1957, p. 3153-3154.

Some 99.8% pure copper plates covered with 0.05 mm. thick film of 99.5% pure aluminum were immersed in solution of sodium hydroxide. Measure of corrosive power of solution in function of time permitted determination of instant at which equilibrium was established between base metal and electrolyte. (R6j; Al)

421-R. Oxidation of Evaporated Barium Films (Getters). R. N. Bloomer. *British Journal of Applied Physics,* v. 8, Aug. 1957, p. 321-329.

Description and explanation of experiments on oxygen reaction with barium to increase thickness of an oxide layer growing upon metal. Explanation is based on Mott's theory of oxidation of metals and the assumption that condensation of the first monolayer of oxygen can only start at and continue about nuclei in the surface of the metal film. 22 ref. (R2h; Ba, 14-12)

422-R. Corrosion Characteristics of Aluminum and Its Alloys. Pt. 2. R. F. Darnell. *Chemical Industry & Engineering,* v. 9, Aug. 1957, p. 19-23.

Effect of purity and alloying conditions on corrosion resistance; serviceability of aluminum under exposure to atmospheric attack, natural waters, sea waters, soil contamination, building materials, chemicals. 25 ref. (R general; Al)

423-R. Corrosion Resistance of Titanium. *Corrosion Prevention and Control,* v. 4, Sept. 1957, p. 33. (CMA)

ICI is seeking a market for titanium on the basis of its corrosion resistance. The metal resists sea spray and immerson in sea water, even when fouling organisms grow on it. Titanium does not pit or etch in aerated sea water, nor do its fatigue properties diminish. Its nontoxicity in an environment of food products or body fluids is noted. Galvanic corrosion of titanium is not noticeable, but other metals coupled with titanium show varying amounts of corrosion. (R general; Ti)

424-R. Chemical and Electrochemical Properties of $FeSn_2$. Roger A. Covert and Herbert H. Uhlig. *Electrochemical Society, Journal,* v. 104, Sept. 1957, p. 537-542.

To determine corrosion properties of alloy layer existing between steel base and tin surface of tin plated steel, measurements of hydrogen overvoltage, corrosion potential and corrosion rates in two aqueous media were investigated. 13 ref. (R11; *Sn,* ST, 8-12)

425-R. Corrosion Resistant Materials—Metals and Alloys. Lester F. Spencer. *Metal Finishing,* v. 55, Oct. 1957, p. 58-62.

Factors influencing the corrosion resistance of lead alloys, with special reference to the use of lead as a component of containers for oxide used in cleaning, anodizing, electroplating and pickling operations. (R6, T29m, 17-7; Pb)

426-R. Scaling of Billets. J. Moreau and M. Cagnet. *Metal Treatment and Drop Forging,* v. 24, Sept. 1957, p. 362-366.

Results presented deal with total thickness, proportion of the different phases, porosity and adherence of the scale, together with the degree of atmospheric contamination and the decarburization of the underlying metal. (To be continued.) (R2q; 4-2)

427-R. Testing and Examination of Electrodeposits. Pt. 3. Salt Spray Testing. R. Quarendon. *Product Finishing,* v. 10, Aug. 1957, p. 62-71.

Salt spray tests for evaluating corrosion resistance of plated metals. Importance of control of temperature, oxygen volume, movement of spray and shape of specimen. Techniques of salt spray testing and shortcomings. 36 ref. (R11j; 8-12)

428-R. Stress-Corrosion Cracking of Insulated Austenitic Stainless Steel. Arthur W. Dana, Jr. *ASTM Bulletin,* no. 225, Oct. 1957, p. 46-52.

The phenomenon of stress-corrosion cracking which may occur when austenitic stainless steels are exposed to moist thermal insulating materials is believed to result from the action of water-soluble chlorides leached from the insulations. Chemical analyses showed that water-soluble chlorides are present in 85% magnesia, calcium, silicate and glass fiber insulating materials, with little difference in chloride level between them. 7 ref. (R1d, R6; SS)

429-R. Platinum Takes Over. *Chemical and Engineering News,* v. 35, Oct. 28, 1957, p. 65, 108.

Platinum anodes for cathodic protection of ships. (R10d, 17-7; Pt)

430-R. Use of Stainless Steel to Combat Corrosion in the Chemical Industry. Pt. 1. Charles P. Dillon. *Corrosion,* v. 13, Sept. 1957, p. 124-138.

Nature of stainless and reason for corrosion resistance and passivity; relative value of quality control tests and metallographic examination in evaluation of stainless. Comparison of seamless and welded tubing; behavior of several stainless steels in acetic acid, sulphuric acid, caustic, sulphurous acid, phosphoric acid, nitric acid and cooling water environments. (R6g, R4a, T29, 17-7; SS)

431-R. Resistance to Corrosion of Aluminum Alloys for Automotive Applications. E. T. Englehart, W. C. Cochran and E. P. White. *Corrosion,* v. 13, Sept. 1957, p. 555t-560t.

Atmospheric corrosion test data and field service results indicate that aluminum alloys are suitable for automotive trim. (R3, T21c, 17-7; Al)

432-R. Corrosion and Metal Transport in Fused Sodium Hydroxide. Pt. 1. Experimental Procedures. G. Pedro Smith, M. E. Steidlitz and E. E. Hoffman. *Corrosion,* v. 13, Sept. 1957, p. 561t-564t.

Experimental techniques for studying corrosive reactions and metal transport in fused sodium hydroxide at temperatures up to 815° C.; methods include capsule test, cold finger and controlled atmosphere technique. 6 ref. (R6j; R11)

433-R. Aluminum Alloys for Handling High-Purity Water. W. W. Binger and C. M. Marstiller. *Corrosion,* v. 13, Sept. 1957, p. 591t-596t.

Data on water contamination in aluminum alloy storage tanks and piping, for handling distilled and demineralized water. 12 ref. (R4a, T26q, 17-7; Al)

434-R. Formation of Oxide Films on Chromium and 18 Cr-8 Ni Steels. H. J. Yearian, W. D. Derbyshire and J. F. Radavich. *Corrosion,* v. 13, Sept. 1957, p. 597t-607t.

Formation of oxide film on simple chromium and 18-8 stainless steels oxidized in air at temperatures of 300 to 700° C. Film growth followed and components analyzed by electron microscopy and electron diffraction and X-ray diffraction methods. 24 ref. (R1h, M21e, M22; SS)

435-R. Investigation of Inorganic Inhibitors for Minimizing Galvanic Corrosion of Magnesium Coupled to Aluminum. Sara J. Ketcham and Walter Beck. *Corrosion,* v. 13, Sept. 1957, p. 608t-614t.

Fundamental study of mechanism of protection afforded by inhibitors,

magnesium vanadate, barium potassium chromate and calcium sulphide, in reducing galvanic corrosion between magnesium alloy AZ31B and aluminum alloy 2024-T3 in saline solutions. (R10b; Mg, Al)

436-R. NACE Technical Committee Report. Sect. 2. Bibliographies of Corrosion Products. Committee T-3B on Corrosion Products. *Corrosion,* v. 13, Sept. 1957, p. 565t-570t.

Selected abstracts on the identification and composition of corrosion products on aluminum, lead, silver, tin and magnesium alloys.
(R11, S10, S11; Al, Pb, Ag, Sn, Mg)

437-R. Symposium on Corrosion by High Purity Water. National Association of Corrosion Engineers. *Corrosion.* Committee T-3F on Corrosion by High Purity Water (Publication 57-22), v. 13, Sept. 1957, p. 571t-590t.

Papers abstracted separately.
(R4a)

438-R. Measurement of Corrosion Products in High Temperature, High Pressure Water Systems. A. A. Sugalski and S. L. Williams. Paper from "Symposium on Corrosion by High Purity Water." *Corrosion,* v. 13, 1957, p. 572t-574t.

Highly efficient sintered nickel graphite imbedded filter used to remove corrosion products from hot water systems for analysis. Data on performance in removing iron, manganese, chromium and cobalt corrosion products.
(R4a, 2-12, R10a)

439-R. Corrosion of Aluminum-Nickel Type Alloys in High Temperature Aqueous Service. F. H. Krenz. Paper from "Symposium on Corrosion by High Purity Water." *Corrosion,* v. 13, 1957, p. 575t-581t.

Tests to determine effect of alloy composition on corrosion resistance of aluminum alloys containing Ni, Cu, Fe and Si; corrosion rates of three alloys in static and flowing water at 250 to 300° C.; nature of attack. Effects on corrosion of reactor radiation in heat flux. 10 ref. (R4a, 2-12; Al, *Ni*)

440-R. Corrosion of Aluminum in High Purity Water. R. J. Lobsinger and J. M. Atwood. Paper from "Symposium on Corrosion by High Purity Water." *Corrosion,* v. 13, 1957, p. 582t-584t.

In reactor, corrosion rate of 1245 and M-388 aluminum alloys determined in demineralized water at temperatures up to 200° C. Correlation between corrosion rate and effective aluminum surface temperature, effect of hydrogen ion concentration on corrosion rate. (R4a; Al)

441-R. Storage of High Purity Water. Richard R. Dlesk. Paper from "Symposium on Corrosion by High Purity Water." *Corrosion,* v. 13, 1957, p. 585t-588t.

Protection of steel water tanks by coating with red lead paint, metallic zinc paint, synthetic rubber, nickel-phosphorus alloy, electroplated nickel or metallized aluminum; use of aluminum for water tanks; electrical resistance of film developed on 3003 aluminum alloy in tap, distilled and demineralized water.
(R4a, L general, T26q, 17-7; Al)

442-R. Water Conditions for High Pressure Boilers. D. E. Voyles and E. C. Fiss. Paper from "Symposium on Corrosion by High Purity Water." *Corrosion,* v. 13, 1957, p. 589t-590t.

Materials used in construction of boiler systems; operating conditions and data on water purity and corrosiveness. (R4a, T26q, 17-7)

443-R. Corrosion Research. Corrosion of Metals Group of the Chemical Research Laboratory. Pt. 2. *Corrosion Prevention and Control,* v. 4, Sept. 1957, p. 48-50.

Recent research on corrosion of gas service pipes, cathodic protection of copper in presence of hydrogen sulphide; atmospheric filiform corrosion of iron and aluminum; corrosion of electronic packaged goods by volatile contaminants; corrosion protection by lanolin films and vapor inhibitors; steel oxidation at high temperatures.
(R general, A9h)

444-R. Cathodic Protection in Israel. Pt. 1. On the Land. D. Spector. *Corrosion Technology,* v. 4, Aug. 1957, p. 265-268.

Cathodic protection of steel pipe in irrigation networks in Israel. (To be continued.) (R10d, R8; ST)

445-R. Instruments for Cathodic Protection. *Corrosion Technology,* v. 4, Aug. 1957, p. 269-271.

Methods and instruments for measuring potential and resistivity of electrolyte in designing suitable cathodic protection.
(R10d, X general, 1-2)

446-R. Zinc Anodes for Cathodic Protection. J. H. Morgan. *Corrosion Technology,* v. 4, Aug. 1957, p. 272-274.

Cathodic protection afforded by sacrificial zinc anodes for iron and steel structures, galvanized cold water storage tanks, aluminum and lead cables and marine installations such as ship hulls; zinc anode design. (R10d, 17-7; Zn)

447-R. Cathodic Protection of Steel Underground. *Corrosion Technology,*

Optimum protection potential for cathodic protection of steel in underground structures found to be −0.77 v. referred to a saturated calomel electrode. (R10d, R8; ST)

448-R. Protection of Steel Piles in Norway. *Corrosion Technology,* v. 4, Aug. 1957, p. 276-277.

Note on galvanic protection of steel piling. (R10d; ST)

449-R. U. S. Tankers Freed From Corrosion. John Grindrod. *Corrosion Technology,* v. 4, Aug. 1957, p. 278-280.

Hulls and ballast tanks of two chemical tankers protected by magnesium anodes. (R10d, T22g)

450-R. Protective Zinc Anodes. *Industrial Finishing,* v. 9, Sept. 1957, p. 814-816.

Explanation of the principles of cathodic protection, with emphasis on the use and advantages of high-purity zinc as anode material in soil and sea. (R10d, 17-7; Zn-a)

451-R. Mechanism of Formation of Metal Particles in Scale on Nickel Steels. K. Sachs. *Iron and Steel Institute, Journal,* v. 187, Oct. 1957, p. 93-104.

Metal particles form by the preferential oxidation of iron leading to the enrichment in nickel of metal entrapped in the advancing scale, and the transient solution of nickel in the wüstite followed by its precipitation on suitable nuclei. 10 ref. (R2q; AY, *Ni*)

452-R. Corrosion Properties of Zirconium and Zirconium Alloys. M. H. Boyer. *U. S. Atomic Energy Commission,* CRD-T2C-63, Oct. 23, 1951, 8 p. (CMA)

Resistance to a variety of agents. Zirconium dissolves completely in 98.9% NaOH. Proper welding techniques give corrosion resistant joints. (R general; Zr)

453-R. General Corrosion of WAPD Crystal Bar Zirconium. Pt. 1. Effect of Test Conditions. K. M. Goldman and D. E. Thomas. Westinghouse Atomic Power Division. *U. S. Atomic Energy Commission,* WAPD-RM-116, Mar. 21, 1952, 13 p. (CMA)

Test conditions considered were distance and contact in degassed and aerated water, presence of nitrogen, effects of local boiling, convection currents and contamination by carbonyl iron, Na_2SO_4 and NaF. A white corrosion product occurred only in the presence of nitrogen, except where zirconium was coupled to other zirconium specimens by stainless steel or zirconium bolts. The latter occurred most vividly in NaF solution. (R general; Zr)

454-R. Oxidation of Zirconium and Its Relationship to Corrosion in High Temperature Water. D. E. Thomas and J. Chirigos. Westinghouse Atomic Power Division. *U. S. Atomic Energy Commission,* WAPD-98, Oct. 15, 1953, 21 p.

The kinetics of oxidation of zirconium in dry oxygen in the 300-787° C. range differed from oxidation in hot water. The mechanisms are basically alike but corrosion in water has an additional factor which does not become operative until the initial low rate is supplanted by a higher rate (at "breakaway"). 7 ref. (R1h, R4, 2-12; Zr)

455-R. High Temperature Oxidation of Zircaloy in Water. W. A. Bostrom. Westinghouse Atomic Power Division. *U. S. Atomic Energy Commission,* WAPD-104, Mar. 19, 1954, 18 p. (CMA)

Oxidation rates for Zircaloy-2 and Zircaloy-3 submerged in water at 1300 and 1860° C. Extrapolating existing data for zirconium in air coincides with the observed rates. The reaction does not become autocatalytic even above the melting point. (R1h, R4, 2-12; Zr)

456-R. Preliminary Report on Corrosion of Uranium-Base Alloys Containing Niobium and Zirconium. A. E. Dwight and A. H. Roebuck. Argonne National Laboratory. *U. S. Atomic Energy Commission,* ANL-5376, Dec. 19, 1954, 20 p. (CMA)

Composition and heat treatment versus corrosion resistance and hardness. Alloys were exposed to ungassed water at 400° F. Eleven compositions and eight heat treatments were covered. (R4a; U, *Cb, Zr*)

457-R. Oxidation of a Zirconium-50 w/o Uranium Alloy in Oxygen. L. D. Kirkbride and D. E. Thomas. Westinghouse Atomic Power Division.

U. S. Atomic Energy Commission, WAPD-LSR (MM)-43, Sept. 26, 1955, 10 p. (CMA)

The linear corrosion kinetics may be expressed by the equation $K = 1.26 \times 10^4 e - 16300/RT$ in both oxygen and water environments. The corrosion mechanism is therefore not dependent on hydrogen absorption. The corrosion product at 400° C. is tetragonal in both cases. (R1h; Zr, U)

458-R. An X-Ray Study of Zr-U_3Si Diffusion Zones. R. B. Roof, Jr. Westinghouse Atomic Power Division. *U. S. Atomic Energy Commission,* WAPD-TN-532, Nov. 18, 1955, 9 p. (CMA)

The migration of the silicon out of U_3Si cores to form a corrodible silicide indicates that corrosion resistance may be improved by putting a barrier between the Zircaloy clad and the core. Barrier foils of Mo and Cb failed in two weeks or less at 650° F. in the same way as the clad cores. Aluminum looked more promising as a barrier material. 6 ref. (R general, N1; Zr, U, 8-16)

459-R. Effects of Electron Irradiation on the Corrosion of Zircaloy-2 in a Thermal Loop. B. O. Heston and M. D. Silverman. Oak Ridge National Laboratory. *U. S. Atomic Energy Commission,* CF-56-2-2, Feb. 2, 1956, 9 p. (CMA)

A few small crystals were evident on the surface of most irradiated specimens after 32 hr. Upstream and downstream areas had a golden glint and after 54 hr. showed red interference colors. White specks on the irradiated portion increased with irradiation and changed to buff or tan at the end of irradiation. (R general, 2-17; Zr)

460-R. Effect of Welding Atmosphere and Pickling on the Corrosion Resistance of Welded Zircaloy-2 and 3. K. H. Koopman, et al. Knolls Atomic Power Laboratory. *U. S. Atomic Energy Commission,* KAPL-1811. Aug. 8, 1957, 29 p. (CMA)

Autoclave tests on welded Zircaloy-2 and 3 in 680° F. water showed that the welding atmosphere affected corrosion resistance. With a helium-filled Plexiglas chamber, welds had a slight amount of white corrosion products. The effect of the gas shield was greater at higher rates of heat inputs. Zircaloy-3 welds were more susceptible to white corrosion than Zircaloy-2 welds. Corrosion increased with unpickled machined edges and entrapped acid in crevices. (R4; Zr, 7-1)

461-R. Research on the Influence of Ultrasonic Waves on Metallic Corrosion. A. Reggiori and T. Songa. Breda Instituto di Richerche Scientifiche Applicate, Milan, Italy. (Air Research and Development Command.) *U. S. Office of Technical Services,* PB 121964, Nov. 1956, 83 p.

Equipment and techniques for corrosion tests of stainless steel and Armco iron in four conditions—stagnant, with ultrasonic waves, with mechanical agitation, and with mechanical agitation and ultrasonic waves. The presence of ultrasonic waves in the electrolyte increases corrosion rate. Tests with gas-saturated solutions showed this action to be connected with the presence of oxygen in the attacking solution. A magnetostrictive ultrasonic wave generator was built. (R11a, 1-3, 1-24; SS, Fe)

462-R. Corrosive Effects of Protein-Type Foam-Forming Concentrates on Common Metals and Dissimilar Metal Couples. H. B. Peterson and J. C. Burnett. Naval Research Laboratory. *U. S. Office of Technical Services,* PB 131018, June 1957, 22 p. $.75.

Corrosion effects of four protein-type foam concentrate materials currently used for fire-fighting on common construction metals. Stainless 304 was most resistant, and brass, copper, steel and aluminum followed in that order. Aluminum was anodic to all metals except zinc and magnesium. Steady-state electrical current measurements were good indicators of relative intensity of corrosion. (R7p)

463-R. Corrosion of Metals in Tropical Environments. Pt. 1. Test Methods Used and Results Obtained for Pure Metals and a Structural Steel. A. L. Alexander, et al. Naval Research Laboratory. *U. S. Office of Technical Services,* PB 121952, June 1957, 46 p. $1.25.

Corrosion rates and characteristics of aluminum, lead, nickel, zinc, copper and structural steel exposed for eight years to five tropical environments in the Panama Canal Zone. (R3s, 1-4)

464-R. (German.) **Effect of Sulphur Content on Blast Furnace Slag and Its Corrosion Behavior.** Hans Ernst

Schwiete, Ludwig Zagar, Peter Dickens and Paul König. *Archiv für das Eisenhüttenwesen,* v. 28, Apr. 1957, p. 187-194.

Corrosion tests for various conditions; surface treatment of fiber slag; effect of sulphide ion on corrosion of sheet iron.
(R general, 2-10; RM-q, *S*)

465-R. (German.) **Aerosol-Process Used in a New Corrosion Test Chamber.** W. Hess. *IVA Tidskrift för Teknisk-Vetenskaplig Forskning,* v. 28, 1957, no. 1, p. 23-35.

Apparatus and procedures for aerosol fog corrosion testing; comparison with salt-spray tests.
(R11k)

466-R. (Italian.) **Use of Aluminum in Contact With Other Metals.** A. Prati. *Ingegneria Meccanica,* v. 6, July 1957, p. 9-16.

Corrosion tendencies of more common assemblies of aluminum and other metal were evaluated and order of preference to be followed in selection of components of such bimetallic assemblies was established. 6 ref. (R1a; Al, 17-7)

467-R. (Italian.) **On the Causes of Internal Corrosion and Clogging in Water Mains.** R. Sandrinelli. *Ingegneria Sanitaria,* v. 5, Mar-Apr. 1957, p. 48-51.

Problem of corrosion of steel mains for portable water, with special reference to formation of nodular incrustations which, in addition to inducing corrosion, cause stoppage and reduction in carrying capacity; formation of heavy mineral incrustations not connected with corrosion but which contribute to obstruction of piping. (R4a, T26r; ST)

468-R. (Italian.) **Simplified Theory of Corrosion.** F. N. Speller. *Pitture-Vernici,* no. 5, May 1957, p. 335-339.

Explanation in simplified form of mechanism of corrosion as manifested in ferrous structures; directed to paint engineers. 4 ref. (R1, 10-1)

469-R. (Japanese.) **Utilization of Low-Grade Titanium Sponge Produced by the Kroll Process. Pt. 3. Corrosion of Ti-Fe Alloys in Hydrogen Sulphide Atmosphere at High Temperature.** Kazuo Hirayama, Nobuaki Gamo and Takeshi Takei. *Tokyo Scientific Research Institute, Reports,* v. 33, July 1957, p. 228-233. (CMA)

Corrosion resistance was not influenced by iron content, and was far superior to that of 18-8 stainless steel. Appreciable corrosive attack by hydrogen sulphide was observed at 600° C. and above. A relatively compact film of metallic sulphide was formed during the corrosion process, and the process was controlled by mutual diffusion of metallic and gaseous ions through the sulphide film. Corrosion rendered the alloys somewhat brittle, the degree of brittleness being proportional to the time and temperature. This embrittlement is attributed to the absorption of hydrogen. 7 ref.
(R7k, 2-12; Ti)

470-R. (Croatian.) **Cathodic Protection of Iron. Pt. 3.** Tihomil Markovic. *Nafta,* v. 8, May 1957, p. 147-150.

Laboratory tests revealed that corrosiveness of soil can be reduced by saturating soil with water, which increases effectiveness of cathodic protection. (R10d, R8; Fe)

471-R. (Czech.) **Bleaching Clay as Cause of Corrosion.** Villiano Pallo and Joseph Prokes. *Electrotechnicky Obzor,* v. 46, no. 5, 1957, p. 245-247.

Sulphur in bentonite is liberated in course of refining process and causes severe corrosion of refining equipment and passes into the petroleum. Method for removing sulphur from bleaching clay. (R7k)

472-R. (German.) **Aqueous Corrosion Problems in Nuclear Reactors at High Temperatures.** Willibald Machu. *Atomkern Energie,* v. 2, July 1957, p. 248-255.

Aluminum, zirconium and beryllium as cladding materials for uranium and thorium; corrosion properties of materials used in construction of reactors such as stainless steel, chromium, nickel, cobalt, titanium, gold, platinum, silver, magnesium, copper, technetium. 29 ref.
(R4a, W11p, 17-7)

473-R. (German.) **Corrosion Protection With Inhibitors.** H. Peukert. *Industrie-Anzeiger,* v. 79, July 19, 1957, p. 882-883.

Vapor phase inhibitors are good protectors against corrosion of steel and iron products, especially in shipping of finished products.
(R10b; ST)

474-R. (German.) **Resistance of Copper Pipes to Sea Water.** K. Eichhorn. *Werkstoffe und Korrosion,* v. 8, Aug-Sept. 1957, p. 453-456.

Sea water pipes for ships consisting of Cu-Ni alloys (5% Ni) and of aluminum brass (2% Al) are more durable than those of copper alone. 6 ref. (R4b; Cu, *Ni, Al*)

475-R. (German.) **Stress-Corrosion of Wrought Alloys of Aluminum.** H. Vosskuhler. *Werkstoffe und Korrosion*, v. 8, Aug-Sept. 1957, p. 463-480.

Aluminum alloys show different durability depending on their respective electrochemical potentials. Stress-corrosion proceeds in two steps; First, long-term corrosive attack may occur at the grain boundaries; the second step occurs when the exposed surface of the potential accelerates the corrosive attack. 69 ref. (R1d; Al)

476-R. (German.) **Corrosiveness of Formaldehyde.** E. Lingnau. *Werkstoffe und Korrosion*, v. 8, Aug-Sept. 1957, p. 480-487.

The corrosive action of formaldehyde is due to the metal ions picked up from storage vessels (e.g., aluminum and steel). Storage vessels of the following materials do not contaminate formaldehyde—copper, nickel, tin, titanium, stoneware, porcelain, enamel, glass and concrete. 79 ref. (R7; Cu, Ni, Sn, Ti)

477-R. (German.) **Inhibition of Corrosion by Atmosphere Treatment.** A. Kutzelnigg. *Werkstoffe und Korrosion*, v. 8, Aug-Sept. 1957, p. 492-498.

Survey of corrosive air pollutants and traces, fog and condensed moisture. Air conditions in workshops; critical humidity, methods of dehumidification, mist dispersion, dust removal and detoxication; protection by use of kraft paper for packing purposes. 52 ref. (R3n, R10a, R10e)

478-R. (Italian.) **Adsorption and Incorporation of Sulphuric Acid Anions in Zirconium Oxide Films.** M. Maraghini and M. Serra. *Ricerca Scientifica,* v. 27, Aug. 1957, p. 2468-2474.

Passivity of zirconium surfaces obtained through oxidation (by air or anodic action) is destroyed by chlorine ions in the presence of SO_4 ions at a certain concentration ratio. By tagging SO_4 ions with radioactive S^{35} it was demonstrated that the destruction of the passivity coincides with a process of replacement of chlorine ions by SO_4 ions within the protective film. 12 ref. (R10c; Zr)

SECTION S

INSPECTION and CONTROL

1-S. Analyzing Aluminum Alloys. Charles Goldberg. *Foundry,* v. 84, Nov. 1956, p. 118-119.

Practical, reliable methods for determination of copper, chromium, silicon, iron, nickel and bismuth in alloys. (S11; Al)

2-S. Echo-Phantoms. Identification and Utilization in Flaw Dectection. Mohammed A. Kassem. *Iron & Steel,* v. 29, Nov. 1956, p. 503-509.

Origin of formation of echoes and their behavior; proposed rational designation of all the echoes, general echo chart for all solids. (To be concluded.) (S13; Pb, Fe, Al)

3-S. (French.) **Magnetic Examination for the Detection of Defects in Specimens and the Sorting of Steel Bars.** M. Blanchard. *Centre de Documentation Sidérurgique, Circulaire d'Informations Techniques,* v. 13, no. 10, 1956, p. 2031-2038.

Influence of defects in a metal specimen on the magnetic field. Production of magnetic fields. Use of cycles of differential permeability in sorting steel bars. Survey of various apparatus and applications. (S10r, S13j, ST)

4-S. (French.) **Properties of the Principal Metals and Alloys Produced by Swiss Metallurgical Factories.** *Pro-Metal,* v. 9, no. 53, Oct. 1956, 5 p.

A nomenclature of alloys with their commercial names, origin, composition, uses, mechanical and physical properties produced in Switzerland in 1956. (S22)

5-S. (German—French.) **Methods for the Rapid Identification of Copper Alloys.** W. Stöckli. *Pro-Metal,* v. 9, no. 53, Oct. 1956, p. 735-738.

Nondestructive electrolytic methods for rapid identification of lead, nickel, manganese and aluminum in copper alloys.
(S10; Pb, Ni, Mn, Al, Cu)

6-S. (German.) **Practice in Nondestructive Testing of Welded Tubes.** H. D. Weise. *Schweissen und Schneiden,* v. 8, no. 10, Oct. 1956, p. 355-358, 360-363.

Applications of X and γ-Ray testing, and of ultrasonic methods. (S13; 7-1, 4-10)

7-S. (German.) **The Present Situation in the Classification of the Welding Processes.** H. Neuenkirchen. *Schweissen und Schneiden,* v. 8, no. 10, Oct. 1956, p. 374-378.

Classification of welding processes and their relation to present standards. (S22, K general)

8-S. (Russian.) **X-Ray Emission Spectra of Mn and Cu in Heusler Alloys Within the Range of Magnetic Transformation Temperatures.** E. E. Vainshtein and B. I. Kotliar. *Doklady Akademii Nauk SSSR,* v. 110, no. 1, Sept.-Oct. 1956, p. 44-47.

Study of shape and position of lines of the $K\beta$-band of the manganese and copper spectra in the Cu_2MnAl-type alloy in the ferromagnetic and the paramagnetic states as well as the $K\alpha_{12}$ lines of the same elements over a wide temperature range. (S11k, P16; Mn, Cu)

9-S. (Russian.) **X-Ray Examination of the Structural Changes Produced by Machining a Steel Surface.** O. N. Shivrin. *Izvestiia Akademii Nauk SSSR, Seriia Fizicheskaia,* v. 20, no. 7, July 1956, p. 736-739.

Study of the uneveness produced on the surface layers of the metal by heavy machining, of a method to raise the primary, secondary and tertiary stresses with varying parameters of the cutting capacity, and a process to relieve these stresses by tempering. (S15, G17, J29; ST)

10-S. (Russian.) **Defect Detection in Castings With the Aid of Radioactive Isotopes.** B. B. Guliaev and L. G.

Demina. *Liteinoe Proizvodstvo,* 1956, no. 9, Sept. 1956, p. 18-20.

Radioactive isotopes in the use of gamma-ray radiography for defect detection in cast metals. (S13c; 5)

11-S. (Russian.) **Precipitation of Columbium and Tantalum From Titanium by Selenious Acid.** I. P. Alimarin and E. I. Stepaniuk. *Zavodskaia Laboratoriia,* v. 22, no. 10, Oct. 1956, p. 1149-1153.

Selenious acid quantitatively precipitates columbium and tantalum in tartaric acid solutions containing hydrochloric acid. Solubility of titanium selenite depends strongly on temperature, so that all operations must be carried out close to the boiling point. (S11; Ta, Ti, Cb)

12-S. (Russian.) **Present State of the Analytical Chemistry of Zirconium.** V. G. Goriushina and V. M. Vladimirova. *Zavodskaia Laboratoriia,* v. 22, no. 10, Oct. 1956, p. 1171-1180.

Separation of zirconium from other elements and methods for its determination. (S11; Zr)

13-S. (Russian.) **A Method of Continuous Automatic Inspection of Materials With the Aid of a Low-Frequency Ultrasonic Defectoscope.** D. I. Vasil'ev and N. F. Shustov. *Zavodskaia Laboratoriia,* v. 22, no. 10, Oct. 1956, p. 1186-1188

Operation, design and efficiency of the apparatus. (S13g)

14-S. (Russian.) **Apparatus for Calibrating Tungsten-Molybdenum Thermocouples.** S. K. Danishevskii. *Zavodskaia Laboratoriia,* v. 22, no. 10, Oct. 1956, p. 1235-1240.

Components of the apparatus and its accuracy. (S23; SG-a, W, Mo)

15-S. **Nonferrous Metallurgical Analysis. A Review.** G. W. C. Milner. *Analyst,* v. 81, Nov. 1956, p. 619-650.

Critical survey of the chemical and physico-chemical procedures available for the determination of major and minor amounts of many constituents of importance in nonferrous metallurgy. (S11; EG-a)

16-S. **Determination of Copper in Steel.** L. J. A. Haywood and P. Sutcliffe. *Analyst,* v. 81, Nov. 1956, p. 651-655.

Copper is complexed with biscyclohexanone oxalyldihydrazone and the resulting blue color is measured by means of the Spekker absorptiometer within the range 570 to 600 mμ. (S11a; Cu, ST)

17-S. **The Polarographic Determination of Chromium in Molybdenum-Chromium Alloys.** D. G. Higgs. *Analyst,* v. 81, Nov. 1956, p. 656-660.

Diffusion-current curves determined over the range −0.5 to −1.3 volts against a Hg pool and polarograms thus obtained on a damped instrument are well formed and extremely easy to read.
(S11m; Cr, Mo)

18-S. **How to Measure Large Dimensions.** Hans W. Schmidt. *American Machinist,* v. 100, Dec. 3, 1956, p. 145-147.

Long gage bars can be combined up to 50-ft. length to avoid special single purpose gages. (S14)

19-S. **Nondestructive Testing of Light Alloy Castings.** V. J. Zabek. *Canadian Metals,* v. 19, Nov. 1956, p. 44, 46, 50, 52.

Methods used in Canadian foundry include fluoroscope, radiography and penetrant inspection. (S13; EG-a)

20-S. **The Gravimetric Determination of Tantalum in Uranium-Tantalum Alloys.** Owen H. Kriege and Ross D. Gardner. *Los Alamos Scientific Laboratory (U. S. Atomic Energy Commission),* LA-2032, Apr. 1956, 20 p.

Determination by acid hydrolysis or by precipitation with cupferron is accurate to within 1%. (S11b; Ta, U)

21-S. **Quality Control of Powdered Metal Parts.** G. L. Bachner. *Machinery, (London),* v. 89, Nov. 16, 1956, p. 1128-1130.

Control measures and tests used to insure uniform, dependable products. (S12g, H general; 6-22)

22-S. **The Sorting of Scrap Metals and Alloys.** E. Scheuer. *Metallurgical Reviews,* v. 1, pt. 3, 1956, p. 339-378 + 2 pages.

Methods and instruments for identification and sorting, sorting plan and practice, practical procedures for aluminum, copper, lead, tin, zinc and alloys. (S10)

23-S. **Quality Control Through Heat Treatment.** Joseph J. Warga. *Metal Progress,* v. 70, Nov. 1956, p. 78-80.

Heat treatment procedures at an aircraft parts plant where consistent high quality is required.
(S general, T24)

24-S. **A Complete Slag Analysis in 45 Minutes.** W. T. Unfried. *Modern Castings,* v. 30, Dec. 1956, p. 32-34.

Total element present is determined and calculated to the percent of its most prominent form. Sample weights were chosen that can utilize standard laboratory solutions already prepared.
(S11; NM-p, Fe, Cr, Mg, Mn)

25-S. **The Use of Trialkyl Phosphine Oxides as Extractants in the Fluorometric Determination of Uranium.** J.

C. White. *Oak Ridge National Laboratory (U. S. Atomic Energy Commission),* ORNL-2161, Nov. 1956, 24 p.

Tri-*n*-actyl and tri-*n*-decylphosphine oxides quantitatively extract uranium from solutions that are as concentrated as 12 molar with respect to such acids as sulphuric, phosphoric, and hydrochloric. (S11; U)

26-S. A Survey of Surface Finish Inspection Techniques. C. H. Good. *Steel Processing,* v. 42, Nov. 1956, p. 641-644, 648-650.

Available techniques, their limitations, advantages and applications. (S15)

27-S. (Dutch.) **Radioistopes. IV. Gamma Radiography for Nondestructive Materials Testing.** T. van der Klis. *Bedrijf en Techniek,* v. 11, no. 265; *Electronica section,* v. 9, no. 212, Nov. 1956, p. 169-173, 175.

Use of cobalt-60, cesium-137, iridium-192 and thallium-170 to determine structure and possible defects. (S13e; Co, Tl, Cs, Ir)

28-S. (German.) **Studies of the Emission Spectral Analysis of Steel With the Photo-Electrometer.** Heimar Pfundt and Hans Krempl. *Archiv für das Eisenhüttenwesen,* v. 27, no. 10, Oct. 1956, p. 629-635.

Multipliers used in the analysis were compared with photographic plates. A simple photoelectric arrangement is described. (S11n; ST)

29-S. Determination of Chloride in Titanium Sponge by the Rapid Potentiometric Method. H. V. Malmstadt, E. R. Fett and J. D. Winefordner. *Analytical Chemistry,* v. 28, Dec. 1956, p. 1878-1882.

Analysis involves a final measurement of the voltage difference between two silver-silver chloride electrodes in a concentration cell, one arm of which contains the unknown chloride solution and the other a standard chloride solution. (S11n; Ti)

30-S. Indirect Determination of Free Titanium and of Oxygen in Titanium-Oxygen Alloys by Hydrogen Evolution Method. M. E. Straumanis, C. H. Cheng and A. W. Schlechten. *Analytical Chemistry,* v. 28, Dec. 1956, p. 1883-1884.

Free titanium is calculated from the volume of hydrogen developed by the metal in hydrofluoric acid, if the sample is free from other hydrogen-developing metals. Oxygen is calculated on the basis of the lower volume of hydrogen developed in hydrofluoric acid because of the presence of oxygen in the alloys. (S11; Ti)

31-S. Flame Spectrophotometric Determination of Copper in Ferrous Alloys. John A. Dean and J. Harold Lady. *Analytical Chemistry,* v. 28, Dec. 1956, p. 1887-1889.

Copper, in the form of the salicylaldoxime complex, is selectively extracted from the aqueous solution of the sample with either chloroform or *n*-amyl acetate. (S11; Cu, Fe)

32-S. Flame Spectrophotometric Determination of Gallium in Copper-Gallium Alloys. Villiers W. Meloche and Benny L. Beck. *Analytical Chemistry,* v. 28, Dec. 1956, p. 1890-1891.

Includes effects of iron, aluminum, thallium, indium and zinc upon the emission of gallium solutions. (S11; Cu, Ga)

33-S. Spectrophotometric Method for Simultaneous Determination of Nickel and Cobalt. R. D. Whealy and S. O. Colgate. *Analytical Chemsitry,* v. 28, Dec. 1956, p. 1897-1898.

Aqueous solutions of nickelous and cobaltous nitrates react completely with excess diethylenetriamine to form solutions of colored complexes. (S11; Ni, Co)

34-S. Experimental Determination of Oxygen in Cupola-Melted Cast Iron. E. A. Loria, H. W. Lownie, Jr., and M. W. Mallett. *Journal of Metals,* v. 8; *American Institute of Mining and Metallurgical Engineers, Transactions,* v. 206, Dec. 1956, p. 1670-1672.

Analyses on metal and slag from melts made under normal and oxidizing conditions. From these data, relations were established between melting variables and composition of the cast iron. (S11r, E25r; CI)

35-S. Gas Content of Solid Aluminum by Solid Extraction and Vacuum Fusion. James L. Brandt and C. Norman Cochran. *Journal of Metals,* v. 8; *American Institute of Mining and Metallurgical Engineers, Transactions,* v. 206, Dec. 1956, p. 1672-1674.

With properly prepared specimens, reproducible hydrogen contents of aluminum alloy samples can be secured by either method. Because of the rapidity with which analyses can be obtained, vacuum fusion has a decided advantage over solid extraction. (S11r; Al)

36-S. Method for Spectrochemical Determination of Aluminum in Fe-Al Alloys. Edward F. Runge and Ford R. Bryan. *Journal of Metals,* v. 8; *American Institute of Mining and*

Metallurgical Engineers, Transactions, v. 206, Dec. 1956, p. 1674-1676.

Procedure exhibits high precision and is adaptable to either photographic or direct reading instruments. It provides for the determination of aluminum in the concentration range between 8 and 16% and is designed for routine control purposes. (S11; Fe, Al)

37-S. A Second Look at Radiographic Inspection of Lead Linings Druing Fabrication. William Skiba. *Mechanical Engineering,* v. 78, Dec. 1956, p. 1125-1127.

Time shows that with gamma-ray inspection, defect-free homogeneously bonded lead linings can be produced. (S13e; Pb, 7-8)

38-S. Lessons To Be Learned From Failures in Service. G. A. Cottell. Paper from "International Conference on Fatigue of Metals". v. III. The Institution of Mechanical Engineers. 9 p. + 4 plates.

Causes, recognition and prevention of corrosion-fatigue and dry-fatigue. (S21, R1e, Q23g)

39-S. (French.) **Recent Progress in Using Gamma Rays for Testing Castings.** A. Blondel. *Métaux, Corrosion-Industries,* v. 31, no. 374, Oct. 1956, p. 396-406.

Light alloy specimens can be tested by artificial radioactive isotopes. Application of cobalt-60, indium 192 and thulium-192 and care of negatives in gamma-ray exposures. Cesium-137 and cerium-144 as new possible sources of radioactive isotopes. (S13e; EG-a39, 5)

40-S. (French.) **Determining Hydrogen in Liquid Steel.** M. Lacomble and A. Coune. *Revue Universelle des Mines,* v. 12, ser. 9, no. 11, Nov. 1956, p. 602-607.

The apparatus, working conditions and sampling methods used in determining hydrogen in steels. A study of the effect of sampling time on hydrogen content. (S11r; H, ST)

41-S. (French.) **Determining Phosphorus in Steels by Direct Spectrum Analysis.** A. Hans, M. Lacomble and L. Charlet. *Revue Universelle des Mines,* v. 12, ser. 9, no. 11, Nov. 1956, p. 607-613.

The spectral difficulties in determining phosphorus were overcome by using a spectrograph provided with a precision grating and other special accessories. The copper influence was eliminated and the spectral results confirmed by further chemical determination. (S11k; P, ST)

42-S. (German.) **Gamma-Rays in Material Testing.** Gunther Münch. *Giesserei,* v. 43, no. 23, Nov. 8, 1956, p. 745-750.

Nondestructive testing with γ-rays. Apparatus, radiation protection, error considerations, practical suggestions. (S13e)

43-S. (Italian.) **Ultrasonic Tests.** E. Martin. *Metallurgia Italiana,* v. 48, no. 6, June 1956, p. 261-271.

A study of the principle, various methods used, results in applying nondestructive ultrasonic material testing to railroad rolling stock in Germany. (S13g)

44-S. (Book—German.) **X-Ray Analysis of Metals. Röntgenographic der Metalle.** M. W. Maltsev. VEB Verlag Technik, Berlin, NW7, 240 p. 1955. $5.75.

A textbook for students and engineers working in metallurgical mills and in machine-construction fields, where nondestructive tests of materials are applied. Detection of material flaws, qualitative and quantitative analysis, crystalline structure, and phase analysis of alloys. (S13e, S11p, M22, M23)

45-S. Ultrasonic vs. Radiographic Inspection of Bonded and Brazed Assemblies—an Evaluation. Earl R. Weiher. *American Machinist,* v. 100, Dec. 17, 1956, p. 121.

Inspection of honeycomb sandwich; ultrasonics effective for adhesive bonded assemblies, radiography better for brazed assemblies. (S13e, S13g; 7-2, 7-8)

46-S. Radiography Tests Brazed Stainless Sandwich. S. Maszy. *American Machinist,* v. 100, Dec. 17, 1956, p. 125-127.

Unique radiographic inspection technique by which all brazed honeycomb construction may be 100% inspected. (S13e; SS, 7-2)

47-S. Spectrophotometric Determination of Aluminum in Titanium and Titanium Alloys. An Aluminon Method. D. K. Banerjee. *Analytical Chemistry,* v. 29, no. 1, Jan. 1957, p. 55-60. (CMA)

A fast method of estimating the aluminum in titanium uses aluminon and is adapted to routine work. The range of 0.1-1.0% Al is covered by conventional colorimetry and the 1.0-10.0% range by differential spectrophotometry. The absorbance maximum is 540 mμ. Reagents are enumerated and procedures recommended. 11 ref. (S11; Ti, *Al*)

48-S. Separation and Determination of Microgram Amounts of Molybdenum. G. R. Waterbury and C. E. Bricker. *Analytical Chemistry,* v. 29, Jan. 1957, p. 129-135. (CMA)

Micro-amounts of molybdenum in the presence of iron may be separated and determined in plutonium alloys by extracting molybdenum into hexone from a 6M HCl solution, back-extracting into water, precipitating iron, and colorimetrically estimating molybdenum using chloranilic acid as the color reagent. Only tin, tungsten and bismuth interfere seriously. Reliability is good. (S11; *Mo,* Pu)

49-S. How Simpler Steel Specifications Lower Costs. *Iron Age,* v. 178, Dec. 13, 1956, p. 132-134.

Ford Motor Co. achieves cost reduction by specifying end properties desired, not specific steel or processing technique. (S22, A4s)

50-S. X-Ray Spectrograph Eliminates Production Bottleneck. Vern W. Palen. *Iron and Steel Engineer,* v. 33, no. 12, Dec. 1956, p. 151-155.

X-ray technique for determining amounts of lead dispersion in steels; casting techniques for attaining uniform distribution of lead in steel. (S11p, D9k; ST, *Pb*)

51-S. Classification of Contractors' Standards for the Procurement of Bureau of Aeronautics Aluminum and Magnesium Castings. E. L. Criscuolo and N. Modine. *Nondestructive Testing,* v. 14, no. 6, Nov.-Dec. 1956, p. 28-31.

An analysis of contractors' radiographic standards on grade distribution, frequency of defects, acceptable grade level, and film-to-casting ratio. (S13e, S22; Al, Mg, 5)

52-S. Considerations Affecting Future Pressure-Vessel Codes. J. J. Murphy, C. R. Soderberg, Jr., and D. B. Rossheim. *Welding Research,* v. 21, Dec. 1956, p. 582s-596s.

Basic principles for revision of the ASME pressure-vessel codes to a broader base to suit the wide variations in service and economic demands. 18 ref.
(S22, T26q, K general)

53-S. Principles of Shipyard Radiography. E. J. Duffy. *Welding and Metal Fabrication,* v. 24, no. 12, Dec. 1956, p. 442-446.

X-ray and gamma-ray equipment and shipyard radiographic inspection practice. (S13e, T22)

54-S. (French.) **Spectrophotometric Determination of Phosphorus in Iron Castings.** L. Baraicovich and M. F. Landi. *Fonderie,* no. 129, Oct. 1956, p. 381-388.

Method proposed by W. G. Boyer superior to classic method in accuracy; suitable for determination of P in ferro-manganese carbide. (S11k; CI, *P*)

55-S. Determination of Small Amounts of Cobalt in Steels and Nickel Alloys by the Isotope Dilution-Anodic Deposition Method. Darnell Slayer and Thomas R. Sweet. *Analytical Chemistry,* Jan. 1957, p. 2-4.

Method involving cobaltinitrite separation, isotope dilution, and anodic electrodeposition. Time of standing of the cobaltinitrite precipitate is 30 min. (S11; ST, Ni, *Co*)

56-S. First Results of the Intensive Use of Ultrasonics for the Detection of Axle Flaws. E. Meyer. *International Railway Congress Association Monthly Bulletin,* v. 33, Dec. 1956, p. 973-984.

Experience with the apparatus satisfactory; solid axels which are fractured can be detected and removed; Operating expenses are lower. (S13g, T23)

57-S. Volatile Impurities in Silicon and Germanium. Harold A. Papazian and Sumnev P. Wolsky. *Journal of Applied Physics,* v. 27, Dec. 1956, p. 1561.

Mass spectrographic analysis of the volatile impurities present. Impurities are hydrogen, water, carbon monoxide, carbon dioxide and nitrogen. (S11c; Si, Ge, 9-1)

58-S. The Detection of Rolling Defects in Steel Sheet. A. M. Armour. *Metallurgia,* v. 54, Dec. 1956, p. 301-304.

Methods discussed involve ultrasonic, mechanical, electrical and magnetic processes.
(S13, 9-21; ST, 4-3)

59-S. Cathode Ray Polarography. J. W. Martin and J. W. Westwood. *Metallurgia,* v. 54, Dec. 1956, p. 305-311.

Techniques employed and applications, including determination of impurities in metal ores. 31 ref.
(S11m; RM-n, 9-1)

60-S. Inspection and Testing Forum on Technical Progress. *Steel,* v. 140, Jan. 7, 1957, p. 306-314.

Thirteen of the industry's authorities briefly give significant developments. A few of these are automatic hardness testing, use of fluorescent magnetic particles in steel mills and

increasing use of ultrasonics. (S general, Q general)

61-S. (Japanese.) **Photometric Determination of Zirconium in Magnesium and Aluminium Alloys.** S. Hashimoto and S. Kato. *Light Metals,* v. 11, no. 21, 1956, p. 76-84. (CMA)

A photometric method for determining zirconium in aluminum and magnesium is based on sodium alizarin sulphonate. The procedure is outlined. Absorbencies are measured at 520 m. The dissolution with dilute HCl, to separate acid-soluble from acid insoluble zirconium, was very satisfactory. (S11a; Mg, Al, *Zr*)

62-S. (English.) **Studies on the Flame Spectrochemical Analysis. Pt. V. Determination of Manganese.** Shigero Ikeda. *Science Reports of the Research Institutes, Tohoku University,* v. 8, Dec. 1956, p. 449-456.

Influences of various acids and elements; calibration curve for manganese; determination of manganese in ferromanganese alloy. (S11a; AD-n31, *Mn*)

63-S. (English.) **Studies on the Flame Spectrochemical Analysis. Pt. VI. Determination of Strontium.** Shigero Ikeda. *Science Reports of the Research Institutes, Tohoku University,* v. 8, Dec. 1956, p. 457-462.

Influences of diverse acids and elements; calibration curve of strontium; determination of strontium in shell and limestone. (S11a; Sr)

64-S. **Turbidimetric Determination of Chlorine in Titanium.** H. J. G. Challis and J. T. Jones. *Analyst,* v. 81, no. 969, Dec. 1956, p. 703-708. (CMA)

A method has been developed for estimating the chlorine in titanium by turbidimetry of AgCl in an absorptiometer; advantages are speed, simplicity and applicability to routine control. Comparison is made with the gravimetric method. Recovery of chlorine is satisfactory over the range 0.0001-0.0075 g. of chlorine. The procedure is given, including sampling precautions. (S11; Ti, *Cl*)

65-S. **International Agreement Sought on Specifications for Gray Iron.** H. W. Lownie Jr. *Foundry,* v. 85, Feb. 1957, p. 120-122.

Proposed international specifications dealing with the properties of iron in test bars in some ways resembles ASTM, A-48 specifications. (S22; CI-n)

66-S. **Surveyor's Viewpoint on Steel Castings.** S. F. Dorey, *Iron and Steel,* v. 30, Jan. 1957, p. 25-27.

Inspection methods, incidents and types of defects and repair of faults. (S13; ST, 5, 9)

67-S. **Control by Quantameter.** *Iron and Steel,* v. 30, Jan. 1957, p. 30.

Recording spectrometer at Samuel Fox and Co., Ltd., aids production control by rapid analysis of steel. (S11k; ST)

68-S. **Monitor Measures Oxygen Content in Flue Gases to Give Peak Combustion Efficiency.** *Iron and Steel Engineer,* v. 34, Jan. 1957, p. 172-174.

Basic components and use of multiple probes for average sample of monitor systems. (S11r)

69-S. **Symposium on Titanium III. Analytical Developments.** S. Vigo. *Journal of Metals,* v. 9, Jan. 1957, p. 173-177. (CMA)

The program of cooperative research on the analysis of additions and impurities of titanium is described. Determinations of oxygen by the methods of spectroscopy, bromination, chlorination and vacuum fusion are compared. Typical task force results are presented for chromium, molybdenum, iron, vanadium, manganese, tin and nitrogen. Analytical methods are compared in the analysis of Ti-6Al-4V. (S11; Ti)

70-S. **The Alcohol-Iodine Method for the Extraction of Inclusions From Steel.** J. E. Garside, T. E. Rooney and J. J. J. Belli. *Journal of the Iron and Steel Institute,* v. 185, Jan. 1957, p. 95-103.

Review of development of method. Apparatus and procedure. Preparation of samples and analysis of residues. Application to various types of steel. 16 ref. (S11; ST, 9-19)

71-S. **Production Control Quantometer for Steelworks Analysis.** D. Manterfield and W. S. Sykes. *Journal of the Iron and Steel Institute,* v. 185, Jan. 1957, p. 105-113.

Principles involved and a description of the instrument and its scope. Iron is used as an internal standard for steel analysis and the instrument calibrated against standard samples of known composition. Results are equal in accuracy to those obtained by chemical methods. 10 ref. (S11c; ST)

72-S. **International Standards for Wrought Light Alloys. Part VII. Indian Standards.** *Light Metals,* v. 20, Jan. 1957, p. 24.

Indian standards on wrought aluminum for utensils, aluminum sheets

and coils for aircraft purposes, aluminum-magnesium alloy sheets and coils. (S22; Al, 15-11)

73-S. Quality Control of High-Temperature Alloys. G. T. Harris. *Metal Progress,* v. 71, Jan. 1957, p. 90-94.

If the variation in properties of high-temperature alloys were reduced, the alloys could be used at higher temperatures or higher stress levels than are now safe. Vacuum melting appears to be one method of reducing the variation.
(S12, C25; SGA-h)

74-S. Recent Uses of Radioactive Isotopes in Britain. John F. Cameron. *Metal Progress,* v. 71, Jan. 1957, p. 103-108.

Difficult problems in thickness gaging have been solved with instruments using beta rays and the backscattering of gamma rays. Trace impurities are estimated by irradiating the sample and measuring the induced radiations and their rate of decay. (S19, S11q, S14e; 14-13)

75-S. The Volumetric Determination of Antimony in Antimony-Lead Alloys. E. G. Brown, I. P. Forshaw and T. J. Hayes. *Metallurgia,* v. 55, Jan. 1957, p. 45-47.

A rapid volumetric method for the determination of up to 12% antimony in hard lead. 5 ref.
(S11j; Pb, *Sb*)

76-S. A Thermocouple for High Temperatures. Advantage of the "Five-Twenty" Couple. J. C. Chaston. *Platinum Metals Review,* v. 1, No. 1, Jan. 1957, p. 20-22.

A 5% rhodium-platinum; 20% rhodium-platinum couple can be used continuously up to about 1700° C. with absolute limit for single determinations at approximately 1825° C. (S16j; SGA-a)

77-S. Spectrographic Determination of Impurities in Zirconium. J. A. Norris. *U.S. Atomic Energy Commission. MIT*-1049, June 30, 1950, 41 p. (CMA)

A method for the spectrographic analysis of zirconium consists of three alternatives: complete combustion of the sample to estimate hafnium, a partial combustion with graphite buffer for high impurity concentrations, and a pyro-electric combustion with a complex buffer carrier mixture for low impurity concentrations. Sample preparation is described. Time of line persistence is given for several common impurities. (S11k; Zr, 2-1)

78-S. Eddy-Current Testing of Zircaloy Tubing. H. M. Schadel, Jr. *U.S. Atomic Energy Commission. WAPD-PWR-FE*-1134, Dec. 8, 1955, 34 p. (CMA)

Eddy-current equipment was tested for production use with Zircaloy-2 tubing for reactor use. Effects of residual cold work, hardness, wall thickness, transverse and longitudinal flaws, and foreign matter were evaluated. Inspection criteria are presented which permit rapid detection of 85% of the flaws.
(S13h; Zr, 4-10)

79-S. Application of Gamma-Radiography. L. Spiro. *Welding and Metal Fabrication,* v. 25, Jan. 1957, p. 21-23.

Describes radiation sources; source containers and exposure methods for weld inspection. (S13e; 1-7)

80-S. (German.) **Highly Sensitive Determination of Carbon With a Recording Conductivity Apparatus.** Walter Koch and Hanns Malissa. *Archiv für das Eisenhüttenwesen,* v. 27, Nov. 1956, p. 695-699.

A procedure developed by Schmidts and Baasch is applied to steel analysis including micro and trace analysis. The kinetic course of the carbon combustion can be followed and irregularities can be recognized. The average error of a measurement is very low. 13 ref. (S11g; ST, CI, *C*)

81-S. (German.) **Rapid Determination of Iron in Slag.** Hermann-Josef Kopinek. *Archiv für das Eisenhüttenwesen,* v. 27, no. 12, Dec. 1956, p. 753-760.

An X-ray spectroscopic method using a commercial X-ray unit for the rapid determination of iron in Thomas slags is described. The iron content can be determined with an accuracy of ± 2%. The analysis takes 4 min. from sampling to transmission of the result. 13 ref.
(S11p; RM-q, *Fe*)

82-S. (German.) **Procedure for the Rapid Determination of Arsenic in Ores, in Nonmetallic Materials and in Nitric Acid Resistant Iron Alloys.** Heinrich Ploum. *Archiv für das Eisenhüttenwesen,* v. 27, Dec. 1956, p. 761-766.

The decomposition of samples containing trivalent arsenic with a mixture of nitric and hydrofluoric acid causes loss of arsenic. An oxidizing fusion is used instead and the arsenic can be coprecipitated with iron (III) oxide hydrate, if necessary. The arsenic is distilled with zinc chloride and determined potentiometrically. 1 ref. (S11; *As*)

83-S. (German.) **Electrochemical Test of the Tin and Passivation Layers on Tinplate.** Walter Katz. *Stahl und Eisen,* v. 76, Dec. 13, 1956, p. 1672-1678.

Electrochemical methods are well suited to determination of layer thickness of tinplate and may be used successfully for testing of alloys and for technical control of the product. Tinplate can be identified by thickness of the alloy layer as well as by crystal formation. Passivation layer thickness is determined by electrochemical reduction and takes place according to a logarithmic rule. 19 ref. (S14c; *Sn,* 8-12)

84-S. (German.) **Temperature Measurement in the Drawing of Steel Wire. Part I.** Werner Lueg and Karl-Heinz Treptow. *Stahl und Eisen,* v. 76, Dec. 13, 1956, p. 1690-1698.

A review of former investigations. Materials tested, equipment for and execution of the tests. Test results: comparative calibration of the temperature measuring apparatus, drawing tests. Comparisons of the different testing methods. 27 ref. (S16, F28; ST)

85-S. (Japanese.) **Research on Granite From the Geologic Point of View.** Rokuro Kuroda. *Nippon Kagaku Zassi,* v. 77, Aug. 1956, p. 1129-1142.

Methods and results of chemical analysis of granites; determination of nickel and lead. (S11; NM-f44, *Ni, Pb*)

86-S. (Japanese.) **Distribution of Tungsten in Granite Minerals in Japan.** Rokuro Kuroda. *Nippon Kagaku Zassi,* v. 77, Aug. 1956, p. 1142-1145.

Determination of tungsten in granite, methods and results of chemical analysis. (S11; NM-f44, *W*)

87-S. (Russian.) **Chromatographic Separation of Radioisotopes of Elements of the Yttrium Group Obtained by the Splitting of Ytterbium and Hafnium With High-Energy Protons.** A. A. Pozdnyakov, V. I. Vernadskiy. *Zhurnal Analiticheskoy Khimii,* v. 11, Sept.-Oct. 1956, p. 566-571.

Separation of Lu^{177}, Yo^{175}, Tu^{170}, Er^{171}, and Ho^{166} formed by the irradiation of the corresponding rare earth oxides with slow neutrons. (S11q, 2-15; 14-13, EG-g)

88-S. **Flaw Detection.** *Aircraft Production,* v. 19, Jan. 1957, p. 27.

Permanent recording of flaw-patterns using adhesive tape. (S13, 1-2)

89-S. **The Determination of Iron in Iron Ores, Slags and Refractories by Thioacetamic Reduction.** P. H. Scholes. *The Analyst,* v. 81, Dec. 1956, p. 688-693.

The reduction of iron solution by hydrogen sulphide formed in situ by the hydrolysis of thioacetamide. The determination of iron in iron ores and results by thioacetamic process. 6 ref. (S11; Fe, 14-9)

90-S. **Determination of Rare Earth Elements and Thorium in Magnesium With Photoelectric Recording Spectrometer.** E. J. Hunemorder and T. M. Hess. *Analytical Chemistry,* v. 29, Feb. 1957, p. 236-238. (CMA)

A spectroscopic method for the lanthanons and thorium in magnesium-base alloys is described and is evaluated statistically. The coefficients of variation shown indicate that the results are acceptable. The instrument used should be capable of resolving the lines Ce 4149.9 and Zr 4149.2. The method employs direct sparking of self-electrodes and photoelectrically records spectral line intensities. Metallurgical history has little effect, but alloy environment is important in the cerium and thorium determinations. 6 ref. (S11a; Mg, *Th, EG-g*)

91-S. **Determination of Vanadium in Titanium-Tetrachloride and Titanium Alloys.** W. H. Owens, C. L. Norton and J. A. Curtis. *Analytical Chemistry,* v. 29, Feb. 1957, p. 243-245. (CMA)

A spectrophotometric procedure has been developed for determining trace vanadium in $TiCl_4$ and added vanadium in titanium alloys. Chromium interferes. A relative accuracy of 2% can be obtained with rapidity. Color fading due to moisture is easily prevented. (S11a; Ti, *V*)

92-S. **Vacuum Fusion Determination of Oxygen and Nitrogen in Lanthanum.** D. T. Peterson and D. J. Beerntsen. *Analytical Chemistry,* v. 29, Feb. 1957, p. 254-257. (CMA)

The vacuum fusion method was modified for use with lanthanum; a nickel bath at 1900° C. is employed, since temperatures below 1825° C. do not give accurate results. The evolved gas is then subjected to mass spectrometry. Nitrogen may be simply determined by a nickel bath at 1600° C. 4 refs. (S11c, 1-23; La, *O, N.*)

93-S. **Analytical Solvent Extraction of Molybdenum Using Acetylacetone.** J. P. McKaveney and H. Freiser.

Analytical Chemistry, v. 29, Feb. 1957, p. 290-292. (CMA)

Acetylacetone selectively extracts Mo(VI) from ferrous material. Employing a solution 6N in H_2SO_4 pre-precludes extraction of copper, tungsten and chromium. Results are somewhat empirical since they are multiplied by 1.04 to compensate for 96% extraction. Molybdenum is determined colorimetrically as the thiocyanate. The MO(VI)-acetylacetone complex might be used colorimetrically if the molybdenum level is high. 8 ref. (S11, *Mo*)

94-S. Pyrohydrolytic Determination of Chloride in Titanium Sponge. A. R. Gahler and G. Porter. *Analytical Chemistry,* v. 29, Feb. 1957, p. 296-298. (CMA)

Chloride may be quickly and precisely determined in titanium sponge by pyrohydrolyzing the sponge at 1000° C. for 30 min. in quartz or nickel apparatus. The chloride collected in the distillate is determined titrametrically with thiocyanate. The method is applicable to a wide range of chloride. 7 ref. (S11g; Ti)

95-S. The Inspection of Drop Forgings. H. J. Merchant. *The Australasian Engineer,* v. 49, Nov. 7, 1956, p. 47-49, 72.

Primary, processing, final and general inspection. (S general, F22n)

96-S. Radio-Isotopes and Their Use in the Foundry Industry. Dr. S. M. Makin. *Foundry Trade Journal,* v. 102, Jan. 3, 1957, p. 5-10.

Radio-tracer technique, photographic effect, absorption and backscattering of beta and gamma rays. 21 ref. (S13e, E general; 14-13)

97-S. Spot Tests for Copper Alloys. W. Stöckli. *Metal Industry,* v. 90, Jan. 1957, p. 31-32.

Description of electrolytic tests. (S10p; Cu)

98-S. Service Life of Metal Belts in Copper Brazing Furnaces. Fred L. Hooper. *Metal Progress,* v. 71, Feb. 1957, p. 83-85.

Woven wire belts used in copper brazing furnaces last longer if tension is reduced, speed is increased and the belt is reversed periodically. (S21, W12, W29; SS, Ni)

99-S. The Use of Nuclear Techniques in Industrial Testing. Charles Crompton. *Steel Processing,* v. 43, Jan. 1957, p. 38-39, 43.

Radiation gages, radiographic techniques, isotope dilution and other methods are establishing new standards of operation. (S13e, S14e, 14-13)

100-S. Chemical Determination of Boron in 7% Uranium-Zirconium and 7% Uranium-Zircaloy. J. Rynasiewicz and V. F. Consalvo. *U.S. Atomic Energy Commission, KAPL-M-JR-8,* Aug. 31, 1956, 10 p. (CMA)

An analytical procedure has been developed for boron in Zr-7U and Zircaloy-7U alloys based on the Colorimetric curcumin method. Alloy chips are fused with Na_2CO_3, dissolved in water, filtered, evaporated and leached with ethanol. 8 ref. (S11a; Zr, *U, B*)

101-S. Methods of Separation of Total Rare Earths in Low-Alloy Constructional Steels. A. Westerburg. *U.S. Watertown Arsenal Laboratory. Report 120/73,* Jan. 18, 1957, 24 p. (PB 121337). Abstracted in *U.S. Government Research Reports,* v. 27, Jan. 18, 1957, p. 24. (CMA)

The lanthanon literature is surveyed comprehensively. Bibliographic selections were limited to those references dealing with chemical separation, fractionation, and determination. Studies of the properties of the lanthanons were included when they might suggest a basis for a new or improved analytical scheme. 388 abstracts are given. (S11; AY-n, *EG-g*)

102-S. (French.) **The Index of Acidity of Slags and Its Use in Casting Copper Alloys. Part One.** *Fonderie,* no. 131, Dec. 1956, p. 515-519.

Chemical analysis of slags and flux in the casting process. (To be continued.) (S11, E11; Cu, RM-q)

103-S. (French.) **Rapid Titration of Aluminum in Copper Alloys.** D. A. Detmar, H. C. Van Aller. *Recueil des Travaux Chimiques des Pays-Bas,* v. 75, Nov. 1956, p. 1429-1432.

A practical method of gravimetric titration of aluminum applicable to all copper alloys having an aluminum content of 0.5% or greater. Aluminum is precipitated through 8-hydroxyquinoline into an ammonia solution containing potassium cyanide, tartaric acid and complexone-III. (S11b; Cu, *Al*)

104-S. (French.) **Contribution to the Study of the Analytic Behaviour of Nitrides in Steels.** P. Tyou, J. Vanstiphout and M. Lacomble. *Revue Uni-*

verselle des Mines, de la Mécanique, de la Métallurgie, v. 99, Dec. 1956, p. 641-652.

Review of literature. Results of tests on properties of titanium, aluminum and silicon nitrides, with new conclusions on solubility of aluminum nitride in acids. Distribution of nitrogen among different analytic fractions studied in terms of methods of attack. Determination of proportions of metallic elements in classic insoluble fraction N_2 permits hypotheses of nature of insoluble nitrides. Effect of a "solubilizing" treatment on analytic proportions. Thesis that application of this thermal treatment would leave only titanium nitrides insoluble seems to be confirmed. 16 ref. (S11; ST, *N*, 14-18)

105-S. (Japanese.) **Research on the Hydrogen Analysis of Iron and Steel.** Toyosuke Tanoue, Munezo Matsuba and Shunsuke Inoue. *Sumitomo Metals,* v. 8, Oct. 1956, p. 255-260.

Apparatus and method. The extracted hydrogen from a sample is oxidized with copper monoxide and the water vapor produced is absorbed with phosphoric anhydride. (S11r; Fe, ST, *H*)

106-S. (Russian.) **Concerning the Effect of Iron on the Colorimetric Determination of Cerium.** R. K. Korabel'nik. *Zhurnal Analiticheskoy Khimii,* v. 11, July-Aug. 1956, p. 419-422.

The photocolorimetric determination of cerium with ferroin (complex compound of ortho-phenanthrolene with ferrous ions) was investigated. The presence of iron in certain concentrations has an adverse effect on the results of the determination by this method, because cerium-iron complexes are formed. (S11a: Ce, *Fe*)

107-S. (Russian.) **The Oxalate Method for the Detection of Cadmium in the Presence of Copper.** M. P. Babkin. *Zhurnal Analiticheskoy Khimii,* v. 11, July-Aug. 1956, p. 503-504.

A method has been proposed for the detection of cadmium ions in the presence of copper ions, whereby the copper ions are transformed into the complex ions $[Ca(C_2O_4)_2]^2$, while the cadmium is precipitated in the form of the white oxalate $Cd_2O \cdot 3H_2O$, which is then converted into cadmium sulphide. (S11; Cu, *Cd*)

108-S. (Russian.) **Concerning the Problem of the Detection of Cadmium in the Presence of Copper.** A. D. Despiller, M. A. Ourinovich and Y. N. Anisinova. *Zhurnal Analiticheskoy Khimii,* v. 11, July-Aug. 1956, p. 505-507.

In view of the fact that cadmium is also reduced when this metal is separated from copper by reducing copper with zinc, it is proposed that the zinc be replaced with aluminum. The experiments described show that aluminum does not reduce the cadmium. (S11; Cu, *Cd*)

109-S. (Russian.) **Concerning the Detection of Beryllium Ions.** V. K. Zoletukhin. *Zhurnal Analiticheskoy Khimii,* v. 11, July-Aug. 1956, p. 508-509.

A method for the qualitative determination of beryllium ions is proposed which is based on the interaction of beryllium hydroxide with fluorides of alkali metals and the formation of OH ions which bring about reddening of phenolphthalein. (S11; Be)

110-S. (Pamphlet.) **Piping Engineering. 2.02. Pipe Material Specifications.** Oct. 1956. 35 p. Natural Cylinder Gas Co., 840 N. Michigan Ave., Chicago 11, Ill.

API specifications for carbon steel, openhearth and wrought iron; ASTM specifications for carbon steels, carbon-molybdenum steels, chromium-molybdenum steels, stainless steels, low-temperature steels and nonferrous metals. Selection of materials for pipes, boilers and unfired vessels.
(S22; CN, AY, SS, EG-a, 4-10, 15-21)

111-S. (Book.) **The Analysis of Titanium and Its Alloys.** 1956. 84 p. Imperial Chemical Industries, Ltd., London, England. (CMA)

Following discussions of sampling and analytical usages, procedures are given for the determination in titanium of aluminum, calcium, chlorine, chromium, copper, hydrogen, iron, magnesium, manganese, moisture, molybdenum, nickel, nitrogen, oxygen and hydrogen, silicon, silver, sodium, tin, tungsten, vanadium, zinc and zirconium. An absorptiometric and a volumetric procedure are recommended for determining titanium. Numerous diagrams of appartus. (S11, 1-2; Ti)

112-S. (Book.) **ASTM Methods for Chemical Analysis of Metals.** 640 p. 1956. American Society for Testing Materials, 1916 Race St., Philadelphia 3, Pa. $8.00.

ASTM methods for chemical analysis of ferrous and nonferrous metals and alloys. Complements Part

I on Ferrous Metals and Part II on Nonferrous Metals of the *Book of Standards.* It is the first complete revision of the volume since 1950. (S11, S22)

113-S. Spectrographic Technique for the Determination of Gallium in Micro Samples. E. M. Murt. *Applied Spectroscopy,* v. 10, no. 4, 1956, p. 210-212.

Spectrographic technique to enhance the sensitivity of gallium determination in microsamples of indium-gallium alloys. Helium atmosphere used. (S11k; Ga)

114-S. Freezing Points of High Purity Metals as Precision Temperature Standard. Part 1. Precision Measurements With Standard Resistance Thermometers. E. H. McLaren. *Canadian Journal of Physics,* v. 35, Jan. 1957, p. 78-90.

Techniques and difficulties in measuring temperature to the highest precision with platinum resistance thermometers. (S16k)

115-S. Contributions to a Solution of the Problem of Short Duration Tests for Determining the Life of Turning Tools. E. Bickel. *Microtecnic,* v. 10, no. 5, p. 209-214.

Objectives and difficulties of short tests, proposals for valid tests. (S21, T6)

116-S. Search for Uranium. (Second Edition.) W. S. Savage. *Ontario Department of Mines, Bulletin* 148, 1954, 15 p.

Uranium and thorium minerals; visual identification, determination by radioactivity, Geiger counter in prospecting for minerals. Methods of analysis and interpretation of assays. (S10, S11s, S19f; U, Th, 14-9)

117-S. Quality Control for Automatics. Harmon S. Bayer and Ray F. Engelgau. *Steel,* v. 140, Feb. 18, 1957, p. 178-180, 183, 186, 189.

Use of statistical quality control has reduced inspection labor, cut scrap, decreased repairs and minimized customer complaints for producer of automatic screw machine products. (S12, G17g)

118-S. (French.) Practical Radiographic and Ultrasonic Control of Metallic Parts. Wiltz and Ruch. *La Normandie Industrielle,* no. 29, Sept. 1956, p. 13-24.

The application of X-rays, gamma rays, isotopes (iridium-192 and cobalt-60) in metallurgical processes such as welding. Notes the measures of protection to be taken to safeguard personnel and furnishes details of the construction of equipment currently employed for radiological and ultrasonic detection. (S13e, S13g, K general, 1-24)

119-S. (French.) New Method for the Determination of Uranium, Radium, Thorium and Actinium in Fine Particles of Radioactive Ore. G. Becquerel. *Journal de Physique et le Radium Physique Appliquée,* v. 17, Nov. 1956, p. 137A-142A.

Technique permitting the simultaneous determination of the presence of uranium, radium, thorium, actinium in very fine particles of radioactive ore by study of the alpha radiation emitted. (S19; U, Ra, Th, Ac, RM-n)

120-S. (French.) Applications of Ultrasonics in Metallurgy and Mechanics. P. Hemardinquer. *Revue Centrale de Mécanique,* no. 95, Dec. 1956, p. 429-433.

Use of ultrasonic processes in testing materials and flaw detection and the correction of defects in castings. (S13g)

121-S. Determination of Traces of Boron in Nickel. R. C. Chirnside, H. J. Cluley and P. M. C. Proffitt. *Analyst,* v. 82, Jan. 1957, p. 18-24.

Determination of boron at the level of a few parts per million in nickel sheet used for the anodes of thermionic valves. The sample is made the anode of a mercury cathode electrolysis apparatus and dissolution of the sample and deposition of dissolved nickel into the mercury proceed simultaneously; the boron in the electrolyte is determined spectrophotometrically by the curcumin method. 6 ref. (S11f, S11k; Ni, *B*)

122-S. Developments in the Micro Vacuum Fusion Method With Particular Reference to the Determination of Oxygen, Nitrogen and Hydrogen in Beryllium, Titanium, Zirconium, Thorium and Uranium. E. Booth, F. J. Bryant and A. Parker. *Analyst,* v. 82, Jan. 1957, p. 50-61.

Applications of the micro vacuum fusion technique. 14 ref. (S11r; Be, Ti, Zr, Th, U, *O, N, H*)

123-S. Determination and Separation of Copper in Metallurgical Products. B. C. Stathis. *Analytica Chimica Acta,* v. 16, Jan. 1957, p. 21-24.

Rivot's process for the separation and the determination of copper as

cuprous thiocyanate has been modified. The modified method involves the reduction of cupric ion in nitric acid solution by ascorbic acid and makes the procedure practicable. The method is applied to a wide variety of metallurgical products. (S11f; Cu)

124-S. Direct Spectrophotometric Determination of Thorium With SPADNS. Gurapada Banerjee. *Analytica Chimica Acta,* v. 16, Jan. 1957, p. 56-61.

A direct spectrographic method for the determination of thorium using SPADNS (sodium salt of 2-p-sulphophenylazo—1.8 dimydroxy-naphthalene-3, 6 disulphuric acid) as a reagent. Moderate amounts of uranium and rare earths do not interfere. The stoichiometric composition of the colored complex has been determined spectrophotometrically by the "slope ratio method". 11 ref. (S11k; Th)

125-S. Determination of Uranium in Alloy Systems. G. W. C. Milner and J. W. Edwards. *Analytica Chimica Acta,* v. 16, Feb. 1957, p. 109-114.

A procedure for the determination of the uranium content of metallurgical alloys containing this element as a minor constituent, by quantitative chemical analysis. (S11; U)

126-S. Determination of Sodium in Aluminum-Copper Alloys Using the Flame Photometer. H. F. Hourigan and J. W. Robinson. *Analytica Chimica Acta,* v. 16, Feb. 1957, p. 161-164.

A flame photometric method of determining sodium in plain aluminum. Method has now been extended to the analysis of aluminum-copper alloys. Silicon does not interfere with the method which is rapid and reasonably accurate. (S11a; Al, Cu, *Na*)

127-S. The Polarographic Determination of Aluminum in Zinc-Base Die-Casting Alloys. J. A. Page, D. H. Simpson and R. P. Graham. *Analytica Chimica Acta,* v. 16, Feb. 1957, p. 194—200.

A procedure for the direct polarographic determination of aluminum, with particular reference to zinc-base die-casting alloys. Interfering elements are removed by electrolysis of a solution of the alloy in a mercury-cathode cell. 14 ref. (S11m; Zn, *Al,* 5-11)

128-S. Quantitative X-Ray Spectrograph Analysis for Uranium With the Use of an Internal Standard. Joseph H. Cope. *Norelco Reporter,* v. 3, Mar.-Sept. 1956 p. 41-43.

For precise quantitative X-ray analysis, the comparison of the unknown sample with standards of almost like composition can correct for disturbing effect quite well. 12 ref. (S11k; U)

129-S. Quantitative Determination of Thorium and Uranium in Solutions by Fluorescent X-Ray Spectrometry. George Pish and Audrey A. Huffman. *Norelco Reporter,* v. 3, Mar.-Sept. 1956, p. 50-53.

A rapid and accurate X-ray fluorescent spectrometric method has been developed in which aqueous and organic solutions can be analyzed directly. 7 ref. (S11c; Th, U)

130-S. Fluorescent X-Ray Spectrographic Determination of Tantalum in Commercial Niobium Oxides. William J. Campbell and Howard F. Carl. *Norelco Reporter,* v. 3, Mar.-Sept. 1956, p. 74-76.

Recent modification in fluorescent X-ray spectrographic instrumentation permits spectra resolution of columbium and tantalum; general analytical theory and procedure, preparation of standards. 8 ref. (S11c; Ta, Cb)

131-S. (Czech.) **Separation and Detection of Vanadium, Molybdenum and Titanium by Capillary Chromatography.** P. Cerny. *Chemicke Listy,* v. 50, Dec. 1956, p. 2026-2028. (CMA)

A capillary of 0.01 ml. capacity is filled with solution of the tested material, and emptied upon filter paper which has been moistened with ammonia. Developed with pyrocatechin, the chromatogram consists of separated concentric rings: the outer (yellow) indicates titanium; the middle (orange), molybdenum; and the inner (blue), vanadium. Iron, if present in considerable proportion as in steels, should be eliminated with rhodanide. The test lasts 3-10 min., is performed with drops, requires minute amounts of material (steel, alloys, ores) and is very sensitive. 3 ref. (S11f; V, Mo, Ti)

132-S. (German.) **Radio-Isotopes in Metallurgy and Metallography.** Traude Bernert. *Berg und Hüttenmännische Monatshefte,* v. 101, Nov. 1956, p. 213-219.

Isotopes as indicators, in diffusion, microstructural research, abrasions, aluminum casting and refin-

ing, continuous process control, thickness control and radiography. 11 ref.
(S18, S13e, S14e, N1a, M23q; 14-13)

133-S. (German.) **Applications of Radiography in Metallurgy.** E. Broda. *Berg und Hüttenmännische Monatshefte,* v. 101, Nov. 1956, p. 228-232.

Tabulation and discussion of metal isotopes showing half life of elements and analytical application of isotopes. (S11q; 14-13)

134-S. (German.) **Examples of Isotope Research in the Iron and Steel Industry.** Helmut Krainer. *Berg und Hüttenmännische Monatshefte,* v. 101, Nov. 1956, p. 246-255.

Isotopes in nondestructive materials testing, phosphorus segregation, nickel-molybdenum steel testing and abrasion measuring. 11 ref. (S general, Q9n, 1-4; ST, *P,* 9-19)

135-S. (Italian.) **Industrial Inspection of Welds by X-Ray and Quantitative Evaluation of Defects Revealed. Porosity Due to Use of Damp Electrodes in Welding of Steel. Part I.** Marco Robba. *Ingegneria Meccanica,* v. 5, Aug. 1956, p. 33-39.

Analysis of current standards for X-ray inspection of welds and for interpretation of radiographs; examination of possibility of a quantitative evaluation of defects. (Continued.)
(S13e, 9-18; 7-1)

136-S. (Italian.) **Industrial Inspection of Welds by X-Ray and Quantitative Evaluation of Defects Revealed. Porosity Due to Use of Damp Electrodes in Welding of Steel. Part II.** Marco Robba. *Ingegneria Meccanica,* v. 5, Oct. 1956, p. 43-48.

Details of series of tests on steel welds determined porous by radiography, microphotometry and mechanical means.
(S13e, S13d, S13b, 9-18; 7-1)

137-S. (Japanese.) **Studies on the Elements in Small Quantities in Iron and Steel. III. On The Titanium and Zirconium Nitrides in Iron and Steel.** Kiichi Narita. *Chemical Society of Japan, Journal, Pure Chemistry Section,* v. 77, Oct. 1956, p. 1536-1539. (CMA)

When iron or steel samples containing nitrogen and titanium or zirconium are treated with dilute hydrochloric acid, the titanium nitride and zirconium nitride will remain quantitatively in the residue without dissolving. These nitrides are Berthollide-type compounds with basic compositions TiN and ZrN. The nitrides undergo quantitative changes during heat treatment, with outward appearance of reversibility, as $TiN \rightleftharpoons [Ti] + [N]$ and $ZrN \rightleftharpoons [Zr] + [N]$. Equilibrium concentration products of titanium and zirconium nitrides were sought for γ-Fe. 8 ref. (S11; ST, *Ti, Zr*)

138-S. (Japanese.) **Rapid Method of Determining Iron in Aluminum. Simultaneous Determination of Copper and Iron in Aluminum. Part 4.** Jisuke Seki. *Japanese Scientific Research Institute, Reports,* v. 32, Nov. 1956, p. 212-217.

Method and results of the chemical analysis; disposal of silicic acid and cupric oxide in precipitate, effect of fluoric oxide titration.
(S11j; Al, *Cu, Fe*)

139-S. (Russian.) **Spectral Analysis of the Gd, Eu, and Sm Content of Metals.** A. N. Zaydel, N. I. Kaliteyevskiy, A. A. Lipovskiy, A. N. Razomovskiy and P. P. Yakimova. *Vestnik Leningradskogo Universiteta,* v. 11, Oct.-Dec. 1956, p. 18-40.

Determination of traces of rare earths in uranium, beryllium, bismuth and other metals; separation of rare earths from beryllium and zirconium. (S11k; EG-g, Be, Zr)

140-S. (Russian.) **Determination of Small Quantities of Beryllium by Means of Hydroxyquinones.** Ye. S. Przheval'skiy, T. A. Belyavakaya and A. P. Golevina. *Vestnik Moskovskoge Universiteta,* v. 11, Jan.-Feb. 1957, p. 191-196.

Colorimetric methods for the determination of beryllium with the aid of quinizarin, naphthazarin, 5, 8-dichloroquinizarin, 1-amino-4-hydroxyanthraquinone, and 1, 4, 5, 8-tetrahydroxyanthaquinone have been developed. Fluorescence methods for the determination of beryllium are proposed by the authors. (S11a; Be)

141-S. (Russian.) **Amperometric Titration of Cadmium With Potassium Iodide in the Presence of an Excess of Pyramidon.** A. K. Zhdanov, V. A. Khadeyev and Ye. K. Makritekaya. *Zavodskaya Laboratoriya,* v. 22, Nov. 1956, p. 1286-1291.

Feasibility of the amperometric titration of cadmium with potassium iodide in the presence of an excess of pyramidon has been demonstrated and the optimum set of conditions for this procedure found. (S11j; Cd)

142-S. (Russian.) **Application of Phytic Acid in the Analytical Chemistry of Thorium.** D. I. Ryabchikov, V. K. Belyayeva and A. N. Yermakov. *Zhurnal Analiticheskoy Khimii,* v. 11, Nov.-Dec. 1956, p. 658-667.

The conditions under which thorium can be precipitated quantitatively with phytic acid were investigated. It was established that upon decomposition of thorium phytinate at 1100°, thorium metaphosphate is obtained. It furthermore has been shown that quantitative separation of thorium with phytic acid can be accomplished in the presence of oxalic acid, which forms complex compounds with titanium, zirconium, uranium and iron. (S11j; Th)

143-S. A Rapid Colorimetric Method for the Determination of Aluminum in Cu-Al Alloys. M. C. Steele and L. J. England. *Analytica Chimica Acta,* v. 16, Feb. 1957, p. 148-149.

Aluminum is determined colorimetrically using Eriochrome cyanine. (S11a; Cu, *Al*)

144-S. Developments in the Micro Vacuum Fusion Method With Particular Reference to the Determination of Oxygen, Nitrogen and Hydrogen in Beryllium, Titanium, Zirconium, Thorium and Uranium. E. Booth, F. J. Bryant and A. Parker. *Analyst,* v. 82, Jan. 1957, p. 50-61. (CMA)

The vacuum fusion method may be used to determine oxygen in 10 to 20-mg. samples with good precision. Speed and ease of operation are advantages. Procedures are given for analysis of the metals named. Similar analyses of vanadium and molybdenum would probably be successful. The technique does not offer reliable results for nitrogen determinations.
(S11r, 1-23; Be, Ti, Zr, Th, U)

145-S. Rapid Routine Method of Determination of Uranium in Ores. H. J. Seim, R. J. Morris and D. W. Frew. *Analytical Chemistry,* v. 29, March 1957, p. 443-446.

A rapid method for the determination of uranium in ores permits detection of as little as 0.01% uranium oxide with a precision of $\pm 0.005\%$. The uranium is separated from all commonly occurring interfering ions by adsorption on an anion exchange resin. 7 ref. (SSf; U, RM-n)

146-S. Magnetic Testing as an Assist to Production Quality Control. Gerald T. Barta. *Metal Products Manufacturing,* v. 14, Mar. 1957, p. 25-27, 78, 84, 85.

Includes basic information on magnetics, reason for quality control testing, and describes the tests applicable to a wide variety of manufactured products. (S13h)

147-S. An Improved Succinate Method for the Determination of Aluminum in Ferrous Materials. R. I. Parker. *Metallurgia,* v. 55, Feb. 1957, p. 103-106.

Method described which includes substitution of potassium metabisulphite and hydroquinone in place of ammonium metabisulphite and phenylhydrazine for iron reduction. The method is not suitable for aluminum-killed mild steel, nor for samples containing fluorine. 12 ref. (S11; Fe, *Al*)

148-S. (French.) **The Applications of Ultrasonics in Metallurgy and Mechanics.** P. Hemardinquer. *Revue Generale de Mecanique,* no. 95 (New Series), Dec. 1956, p. 429-433.

Ultrasonic processes in the welding of light alloys and various types of welds; notes value of ultrasonics in determination and location of flaws, cracks and cavities; quality control; ultrasonics as applied in the foundry and in metallurgical processes in general.
(S13g, K general, 1-24)

149-S. (German.) **Radioactive Isotopes in the Steel Industry.** H. Krainer and E. Krainer. *Schweizer Archiv,* v. 22, Dec. 1956, p. 402-413.

Use of isotopes as tracers and as source of gamma rays for nondestructive testing. (S13e; ST, 14-13)

150-S. (Italian.) **Use of Radioactive Isotopes in Gamma Inspection of Welds Made in Assembling Pressure Piping.** Ugo Bellometti. *Ingegneria Meccanica,* v. 5, Sept. 1956, p. 53-56.

General discussion of gamma radiography with special reference to oleoducts and methanoducts; review of current standards; technical and economic factors to be borne in mind. (S13e; 7-1, 14-13)

151-S. (Swedish.) **Methods of Carbon Determination in Cast and Pig Iron.** Rita Siethniecks. *Gjuteriet,* v. 12, Dec. 1956, p. 164-168.

Value of routine carbon determination for pig iron, gray cast iron and spheroidal graphite cast iron.
(S11; CI-a, CI-n, CI-r)

152-S. Chemical Analysis of Binary Alloys of Platinum and Uranium. Martha S. Richmond, John R. Baldwin and E. June Maienthal. National

Bureau of Standards. *U.S. Atomic Energy Commission,* NBS-4555, Feb. 1, 1956, 19 p.

The analyses of 30 platinum-uranium alloys containing from 0.2 to 95% of platinum. Detailed procedures and experimental data included. Platinum is determined by a stannous chloride-spectrophotometric method in the presence of uranium or by a sulphide-gravimetric method. (S11b, S11k; Pt, U)

153-S. Studies on Ball Bearing Steels (II): Effect of Some Metallurgical Factors on the Life of Ball Bearing Steels. T. Mitsuhashi, M. Ueno and Y. Nakano. Translated by University of Alabama (U.S. Bureau of Ships). *U.S. Office of Technical Services,* PB 121427, July 1956, 17 p. $.50.

Improvement in the life of Japanese domestic ball bearings was sought through a study of the relationship between metallurgical factors and life span. Bearing trouble has been occurring mainly at the inner ring, next on the ball, and then on the outer race. Using inner rings whose life-span had been determined, tests were run on chemical composition, nonmetallic inclusions, hardness, compressive loading, cementite content, grain size and degree of forging. (S21; ST, SGA-c)

154-S. Simultaneous Polarographic Determination of Cadmium and Tin. G. W. Latimer, C. D. Houston and K. E. Eubank. (Wright Air Development Center) *U.S. Office of Technical Services,* PB 121685, Sept. 1956, 13 p. $.50.

An improved method of polarographic analysis to determine simultaneously the percentage of concentration of cadmium and tin is described. Results were judged according to synthetic standards. (S11m; Cd, Sn)

155-S. Polarographic Determination of Gallium in Aluminum and Aluminum Alloys. G. W. Latimer and C. D. Houston. (Wright Air Development Center) *U.S. Office of Technical Services,* PB 121720, Sept. 1956, 17 p. $.50.

Determining aluminum with a polarograph is adapted for analyzing and determining large gallium concentrations in aluminum and particularly to prevent interference of the hydrogen wave. (S11m; Al, *Ga*)

156-S. (Book.) **1956 Supplement to Book of ASTM Standards Including Tentatives. Part 1. Ferrous Metals.** 452 pages. 1956. American Society for Testing Materials, 1916 Race St., Philadelphia, Pa.
(S22; Fe, ST)

157-S. Use of Ion Exchange Resins for Determination of Uranium in Ores and Solutions. Sallie Fisher and Robert Kunin. *Analytical Chemistry,* v. 29, Mar. 1957, p. 400-402.

The separation of uranium from the ions interfering with its analysis is accomplished by the adsorption of the uranium sulphate complex on a quaternary ammonium anion exchange resin. Interference of such ions as iron and vanadium is avoided by their preferential reduction with sulphurous acid so that they are not retained by the resin. The method is applicable to both solutions and ores. (S11f; U)

158-S. The Mutual Separation of Thorium, Protoactinium, and Uranium by Tributyl Phosphate Extraction From Hydrochloric Acid. D. F. Peppard, G. W. Mason and M. V. Gergel. *Inorganic and Nuclear Chemistry, Journal,* v. 3, Jan. 1957, p. 370-378.

The distribution behavior of uranium (VI) and protoactinium (V) in the system aqueous hydrochloric acid—TBP (tributyl phosphate) without diluent has been investigated at 22 ±2° C. and the results compared with those reported for thorium in the system. (S11f; Th, Pa, U)

159-S. Separation of Thorium and Uranium Nitrates by Anion Exchange. D. J. Carswell. *Inorganic and Nuclear Chemistry, Journal,* v. 3, Jan. 1957, p. 384-387.

The anionic character of thorium in nitric acid solutions was investigated and distribution coefficients measured. The results were employed to effect a separation of thorium and uranium by anion exchange. (S11f; Th, U)

160-S. (English.) **Studies on the Flame Spectrochemical Analysis. VII. Determination of Chromium.** Shigero Ikeda. *Tohoku University, Science Reports of the Research Institutes,* v. 8A, Dec. 1956, p. 463-470.

Chromium radiated its spectral line at 359.0, 455.0, 427.5, 428.9 and 520 millimicrons, and the spectrum was most intense at 425.0 and next at 427.5 millimicrons. Alkali metal increased the intensity appreciably, while alkali earth metal depressed the emission remarkably when their concentration became large. Chromium in iron-chromium alloy and slags was determined.
(S11k; Fe, *Cr,* RM-q)

161-S. Nondestructive Testing of EBWR Fuel Blates. W. J. McGonnagle and W. N. Beck. Paper from "Metallurgical Information Meeting, Ames Laboratory", May 1956. *U.S. Atomic Energy Commission,* TID-7526 (Pt. 1), Feb. 1957, p. 1-15.

The following nondestructive testing methods are used for inspecting the EBWR fuel elements; radiography, autoradiography and ultrasonic transmission. A radiographic technique is used to show the location of the core with respect to the end and side clad. The ultransonic transmission technique is used to test for lack of bonding between the core and clad material and for locating blowholes, porosity and pipe in the core billets. (S13e, S13g, T11g)

162-S. Radioanalysis of Krypton and Xenon and Its Use in Diffusion Experiments With Silver. J. Martin Tobin. Paper from "Metallurgical Information Meeting, Ames Laboratory", May 1956, *U.S. Atomic Energy Commision,* TID-7526 (Pt. 1), Feb. 1957, p. 129-149.

A method has been evaluated which is capable of analyzing relative concentrations of krypton and xenon gases whose total concentration is in the range of 10^{-10} to 10^{-6} gram-atoms. The necessary gas collection and gas transfer apparatus is described. (S11q, 1-3; Kr, Xe)

163-S. Inspection of Small Diameter Tubing by Eddy Current Methods. J. W. Allen and R. B. Oliver. Paper from "Metallurgical Information Meeting, Ames Laboratory", May 1956, *U.S. Atomic Energy Commission,* TID-7526 (Pt. 1), Feb. 1957, p. 209-226.

Basic principles of eddy current testing as they apply to the problem of inspecting small-diameter tubing. Both encircling coils and probe coils are considered and the relative advantages of each presented. The inspection problem is described in terms of separation and classification of defect types rather than in terms of mere sensitivity to defects. As a possible means of defining defect types the "impedance analysis" concept introduced by Forster is examined in detail. (S11h; 4-10)

164-S. Application of the Immersed Ultrasonic Technique for the Inspection of Small Diameter Tubes. R. B. Oliver and R. W. McClung. Paper from "Metallurgical Information Meeting, Ames Laboratory", May 1956. *U.S. Atomic Energy Commission,* TID-7526 (Pt. 1), Feb. 1957, p. 227-243.

The criteria for the selection of equipment to inspect tube sizes less than ½ in. in diameter are presented and the testing procedure described. Collimation of the ultrasound beam and the mode of sound propagation are discussed. Capabilities and limitations of this inspection method and typical defects detected. (S13g; 4-10)

165-S. Greater Acceptance of Welding Through the Use of Inspection Methods. John R. Harrer. *Welding Journal,* v. 36, Mar. 1957, p. 252-256.

Magnetic-particle inspection on weldments which are critical from the standpoint of serviceability, strength and alignment. Necessity of establishing adequate standards for such inspection. (S13j; 7-1)

166-S. (French.) **Statistical Methods of Analyzing the Results of Fatigue Tests Conducted on Materials Used in Aircraft Construction.** F. Gatto. *Metaux-Corrosion-Industries,* v. 32, Jan. 1957, p. 18-37.

Principal statistical methods of analyzing fatigue data, including probit analysis and the staircase method, with special reference to light alloys employed in the aircraft industry. 30 ref. (S12, Q7k; EG-a39)

167-S. (German.) **High-Speed Analysis of Magnesium in Iron.** R. Reichert. *Giesserei,* v. 44, Jan. 17, 1957, p. 51-52.

Different methods of determining magnesium. Titration according to G. Schwarzenbach and W. Biedermann. Description of the working method. 7 ref. (S11j; Fe, *Mg*)

168-S. (German.) **Full-Automatic Control of Modern Pit Furnaces.** Karl Rieder. *Stahl und Eisen,* v. 77, Feb. 7, 1957, p. 157-162.

Temperature control by "Siamco" system for pit furnaces; thermotechnical comparison with the previous method of electrical control. (S16r, W20)

169-S. (Italian.) **Comparative Interferometric Measurements.** Alfredo Secciani. *Macchine,* v. 12, Jan. 1957, p. 1-10.

System based on interpretation of fringes of interference produced on surface of a prefectly plane glass disk when placed at an angle on a metal surface permits qualitative and quantitative interpretation of all interferometric phenomena. Physical concepts of system; principal

applications in measurement of errors of planarity, external dimensions of cylindrical and spherical prismatic solids, errors of parallelism of plane surfaces. Numerous examples given. (S15d)

170-S. (Japanese.) **Rapid Determination of Lime in the Slags of Blast Furnaces and Openhearth Furnaces by Ethylenediaminetraacetate Titration.** Shizo Hirano and Moriji Kurobe. *Japan Analyst,* v. 5, Dec. 1956, p. 680-684.

Procedures given. Time required for a test is about 10 min. 10 ref. (S11j; RM-q)

171-S. (Japanese.) **A Rapid Flame Photometric Determination of a Microquantity of Sodium in Lead.** Shanzow Fukushima Shiro Iwatta, Sanshiro Kume and Misako Shigemoto. *Japan Analyst,* v. 5, Dec. 1956, p. 704-707.

Determination of about 0.002% sodium in lead by flame photometric determination requires two days. A rapid method of determination based on the addition standard, linear extrapolation method, carried out without removing the coexisting substances, is described. (S11k; Pb, *Na*)

172-S. (Japanese.) **Rapid Volumetric Determination of Vanadium.** S. Wakamatsu. *Japan Analyst,* v. 6, Jan. 1957, p. 19-22. (CMA)

Vanadium may be quickly determined volumetrically, based on permanganometry of the V(IV) ion. The method is applicable to the analysis of steel and ferrovanadium. Iron in excess does not interfere if oxidized to the ferric state by ammonium persulphate. Sulphuric acid and H_3PO_4 are used to digest the sample. V(VI) is stable regarding valency in hot, white, fuming H_2SO_4. (S11j; ST, AD-n, *V*)

173-S. (Spanish.) **Nondestructive Tests as an Economical Means of Inspecting Welding Production.** A. Junghem and K. E. Gredborn. *Ciencia y Tecnica de la Soldadura,* v. 6, Nov.-Dec. 1956. 8 p.

Possibilities and applications of radiographic and ultrasonic tests. (S13e, S13g; 7-1)

174-S. **For the Foundry. Temperature at a Glance.** *Canadian Metals,* v. 20, Mar. 1957, p. 60-61.

Low-cost immersion thermocouple with recorder enables quick temperature checks. (S16, 1-2)

175-S. **Instrumentation for Temperature Control Guides Continuous Steel Casting.** *Industrial Heating,* v. 24, Mar. 1957, p. 523-528 and 644.

Instrumentation provides measurements of molten metal temperature, control of ladle tilt, regulation of machine speed, cooling water temperature and slab surface temperatures. (S16, S18, 1-2, D9q; ST)

176-S. **Role of Statistical Methods in Controlling the Quality of Non-Ferrous Castings.** A. R. Martin. *Institute of Metals Journal,* v. 24, Feb. 1957, p. 209-226.

Statistical methods of process control suitable for foundry purposes. Conventional ways of presenting and treating test data. Illustrates through work examples selection of appropriate statistical approach and results to be expected from its application. (S12, E general)

177-S. **Standardization and Application of Ultrasonic Surface-Wave Inspection.** George J. Binczewski. *Nondestructive Testing,* v. 15, Jan.-Feb. 1957, p. 36-40.

Application of ultrasonic surface waves as a method for inspecting metal affords a reliable and economical procedure for detecting cracks, seams, inclusions, laps, segregates and porosity. Surface conditions that influence propagation of surface waves and response of waves as affected by distance, depth and edge angles of surface imperfections are reported. Applications are discussed, including surface-cracking on aluminum plate during fabrication. (S13g)

178-S. (Italian.) **Methods of Inspecting Anodic Oxide on Aluminum.** Engineering Staff of Experimental Institute for Light Metals, Novara, Italy. *Alluminio,* v. 26, Jan. 1957, p. 29-34.

Methods used to evaluate thickness, porosity, electrical insulation capacity, and resistance to light, abrasion and corrosion. 10 ref. (S14, S15, Q9n, R general; Al, 8-23)

179-S. (Book.) **Organic Reagents for Metals.** W. C. Johnson, Ed. 199 p. 1955. Chemical Publishing Co., Inc., 212 Fifth Ave., New York 10, N. Y. $4.00.

Reagents covered are either new or older ones for which new methods of application were found and some were designed to solve special problems; in discussing these reagents, a critical approach was used and practical details were carefully checked. (S11; NM-b)

180-S. (Book—French.) **Digest of Magnetic Particle Inspection. Testing of**

Materials by the Magnetic Powder Method. E. A. W. Muller. 169 p. 1957. Dunod, 92, Rue Bonaparte, Paris 6, France.

Use of magnetic powders in flaw detection; review of significant works published; fundamental principles underlying the process; principal industrial applications; methods and apparatus employed; production economies resulting from use of this process. Contains also a bibliography of 151 items. (S13j)

181-S. Use of an Air Jet in the Spectrographic Analysis of Low Alloy Steel. D. L. Fry and T. P. Schreiber. *Applied Spectroscopy,* v. 11, no. 1, 1957, p. 1-6.

Investigation of the function of an air jet blown through the analytical gap and its value in increasing the reproducibility and accuracy of analytical results. (S11k; AY)

182-S. Chemical Analysis of Cupola Slags. Pt. 1. Determination of Alumina. (a) Fluoride Volumetric Method. W. E. Clarke. *British Cast Iron Research Association Journal,* v. 6, Feb. 1957, p. 505-511.

Direct fluoride volumetric method for determination of alumina. (S11j; RM-q, *Al*)

183-S. Effect of Chromium in the Bismuthate Method for the Determination of Manganese. W. E. Clarke and W. B. Shaw. *British Cast Iron Research Association Journal,* v. 6, Feb. 1957, p. 512-518.

Found that chromium up to 5% did not interfere, provided excess sulphurous acid added after first bismuthate oxidation to insure reduction of all chromate formed. (S11; *Mn, Cr*)

184-S. Metallurgy of Cutting Tools. Pt. V. Tool Life Evaluation and Failure. K. G. Lewis. *Iron and Coal Trades Review,* v. 174, Mar. 8, 1957, p. 569-571.

Discussion of flank wear, criteria of tool life, methods of evaluating tool life, types of tool failure. (S21, T6n)

185-S. Inspection Equipment for Sapphire Jets. T. E. W. Preston. *Metalworking Production,* v. 101, Feb. 22, 1957, p. 315-320.

Pantographic device and "Sigma Multihead" system for blade and disk measurements. Magnetic crack detector and other equipment used by Armstrong-Siddeley in inspection of jet engine parts. (S13, S14, T24b)

186-S. How Non-Destructive Testing Aids Power Station Maintenance. Joseph L. McParlan. *Power Engineering,* Mar. 1957, p. 57-60.

Nondestructive testing is an important part of the preventive maintenance program. Tests using plain and fluorescent magnetic particles, fluorescent and dye penetrants, ultrasonic vibrations and gamma radiations are discussed. (S13, W11, 18-21)

187-S. (French.) **Colorimetric Method for the Determination of Uranium by Means of Dibenzoylmethane.** P. Blanquet. *Analytica Chimica Acta,* v. 16, Jan. 1957, p. 44-56.

The complex is formed in aqueous pyridine in the presence of EDTA and tartaric acid; the optical density is measured at 415 $m\mu$. The method involves only one filtration and has been applied with satisfactory results to the analysis of pitchblende, antunite and thorianite, etc., containing from 0.05 to 25% uranium. (S11a; U)

188-S. (German.) **Use of Isotopes in the Metallurgy and Metallography of Nonferrous Metals.** G. Glawitch. *Schweizer Archiv,* v. 23, Jan. 1957, p. 24-27.

Use of isotopes in testing of tools, for thickness measurements, as well as in analysis of metals. 5 ref. (S14e, S11q, M23q; 14-13)

189-S. (Italian.) **Examples of Quality Evaluation in Steel Production.** M. Casadio. *Atti Notizie* (Monthly Bulletin of Italian Metallurgical Assoc.), incorporated in *Metallurgia Italiana,* v. 11, Dec. 1956, p. 404, 418.

Brief description of some of methods used by firm of Cogne, S. p. A., to evaluate quality of melts of alloy steels; data obtained used to judge homogeneity of production. (S general, D general; ST)

190-S. (Russian.) **Quantitative Determination of Beryllium With the Aid of Radioactive Iron.** S. V. Bleshinskiy and V. F. Abramova. *Primeneniye Mechenykh Atomov v Analiticheskoy Khimii,* 1955, p. 37-44.

Method by precipitating the metal in the form of the double oxalate ($K_2C_2O_4 \cdot BeC_2O_4$) and dissolving the precipitate in the presence of a salt of radioactive iron-59. The reduction in the radioactivity of the solution depends on the amount of

precipitate that has gone into solution. (S11q, Be, Fe)

191-S. (Russian.) **Fluoride Method for the Quantitative Determination of Beryllium.** S. V. Bleshinskiy and V. F. Abramova. *Primeneniye Mechenykh Atomov v Analiticheskoy Khimii,* 1955, p. 45-57.

On the basis of experimental work an accelerated method for the determination of beryllium in beryl or concentrates is recommended. (S11; Be)

192-S. (Russian.) **Quantitative Determination by Radioactivation Analysis of the Content of Impurities in Germanium.** I. P. Alimarin, Yu. V. Yakovlev and A. I. Zhabin. *Primeneniye Mechenykh Atomov v Analiticheskoy Khimii,* 1955, p. 58-69.

Principles of radioactivation analysis in general. Determination of rare earth elements, antimony, molybdenum, copper and zinc in germanium is described in detail. (S11q; Ge, 9-1)

193-S. (Russian.) **Application of Radioactive Tracers in the Chromatographic Separation of Rare Earths.** D. I. Ryabchikov and M. M. Senyayin. *Primeneniye Mechanykh Atomov v Analiticheskoy Khimii,* 1955, p. 98-106.

Procedures for the chromatographic separation of rare earths with the aid of radioactive tracers (radioactive isotopes of rare earth elements). A complete scheme for the separation of rare earths by methods which are partly chemical and partly chromatographic is shown. Equipment which has been designed by the authors and their collaborators and used in work of this type is described. (S11q; EG-g)

194-S. (Russian.) **Separation of Spectrally Pure Cerium From Natural Mixtures by the Extraction Method.** V. M. Klinayev and M. M. Senvavin. *Primeneniye Mechenykh Atomov v Analiticheskoy Khimii,* 1955, p. 118-126.

Separation of cerium from other rare earths by extraction of a nitric acid solution with ether investigated on the basis of a finding made by L. Imre. It was established that 90-95% of the cerium is extracted and that this cerium is pure; no other rare earth elements are extracted. Extraction of cerium by this method simplifies the chromatographic separation of the remaining elements of the mixture. (S11f; Ce)

195-S. (Russian.) **Ion-Exchange Separation of the Activities of Rare-Earth Elements Without the Application of pH-Meter.** B. K. Preobrazhenskiy, O. M. Lilova, A. N. Dobronravova and Ye. D. Teterin. *Zhurnal Neorganicheskoy Khimii,* v. 1, Oct. 1956, p. 2294-2299.

Lactic acid solutions were used, the effectiveness of which as eluants was regulated by diluting the solution to the requisite degree. Changes of pH and of eluant capacity during storage were thereby avoided and complete dissociation of the lactic acid brought about, because ammonium lactate is completely ionized, while lactic acid is not. (S11f; EG-g)

196-S. **Determination of Titanium in Plutonium-Titanium.** K. S. Bergstresser. *Analytical Chemistry,* v. 29, Apr. 1957, p. 532-534. (CMA)

Titanium in plutonium-titanium alloys may be determined colorimetrically from the hydrogen peroxide complex. Hydrogen peroxide is added to a $HClO_4$ solution of the alloy and the precipitate formed with plutonium is removed prior to the estimation. Titanium may be determined in the range 0.1-1.0%. Columbium and uranyl ion interfere. 6 ref. (S11a; Ti, Pu)

197-S. **Separation and Determination of Microgram Quantities of Zirconium.** C. E. Bricker and G. R. Waterbury. *Analytical Chemistry,* v. 29, Apr. 1957, p. 558-562. (CMA)

Micro-amounts of zirconium are separated from solutions containing diverse metallic ions, especially plutonium alloys, by precipitation with p-bromomandelic acid. The presence of polyvalent ions exerts a beneficial effect. A single precipitation is often insufficient for complete separation of zirconium. $NH_2OH{:}HCl$ is added to prevent the precipitation of plutonium (IV) tetra-p-bromomandelate. Chloranilic acid is used as the colorimetric agent in 1.4*N* $HClO_4$. (S11a; Zr)

198-S. **The Analysis of Thorium-Cerium Binary Alloys.** G. W. C. Milner and G. W. Sneddon. *British Atomic Energy Research Establishment,* C/R 1740, Sept. 1955, 16 p. (CMA)

Alloys of thorium with 1-99% cerium may be analyzed titrimetrically following dissolution in hydrochloric acid and evaporation to fumes of $HClO_4$. Cerium is determined by oxidation with $(NH_4)_2S_2O_8$ and titration with $Fe(NH_4)_2(SO_4)_2$; ferroin is the indicator. Thorium is determined in

a separate aliquot without separation from cerium. 15 ref.
(S11j; Th, Ce)

199-S. Separation of Heavy Metals With Acid Alkyl Phosphate and Phosphonate Resins. J. Kennedy, R. V. Davies and B. K. Robinson. *British Atomic Energy Research Establishment,* A.E.R.E. C/R 1896, Mar. 1956, 5 p.

Di-alkyl phosphate resin in the hydrogen and sodium form in conjunction with inorganic acids and disodium ethylene di-amine tetra acetate as eluting agents has been successfully employed in the separation of hexavalent uranium from alkaline earths, divalent transitional, trivalent iron and lanthanide elements. Separation from tetravalent cations such as zirconium and thorium was not complete. 6 ref. (S11f; U, EG-f)

200-S. Spectrographic Determination of Molybdenum, Beryllium, Iron, Chromium and Nickel in Bismuth and Bismuth-Uranium Alloys. M. J. Owers and M. S. W. Webb. *British Atomic Energy Research Establishment,* A.E.R.E. C/R 2115, Dec. 1956, 9 p.

Bismuth metal or alloys are converted to oxide, cobalt and vanadium incorporated as standards and 70-mg. charges burnt to completion in cupped graphite electrodes. The resulting spectra are evaluated for molybdenum, beryllium, iron, chromium and nickel over the range 1 to 200 ppm. by microphotometry, and, with the exception of iron, sensitivities of 1 ppm. or better are attained. 7 ref.
(S11k; Bi, U, *Mo, Be, Fe, Cr, Ni*)

201-S. Rapid Analytical Techniques at Canadian Exploration Limited. B. Wilson. *Canadian Mining and Metallurgical Bulletin,* v. 50, Mar. 1957, p. 143-146. (*Transactions,* v. 60, 1957, p. 85-88.)

Analyses in treatment of tungsten and lead-zinc ore include polarographic determination of lead, zinc and cadmium and spectrophotometric method for tungsten; procedures for phosphorus and sulphur.
(S11, W, Zn, Pb, RM-n)

202-S. Determination of Precious Metals in Ores. Clyde L. Lewis. *Canadian Mining and Metallurgical Bulletin,* v. 50, Mar. 1957, p. 163-167.

Examination of reproducibility of results of fire assay method for collection of gold, silver, platinum, palladium and rhodium for spectrographic analysis indicated, despite wide variation in fire assay techniques, that results were not significantly affected. 16 ref.
(S11s, RM-n, *EG-c*)

203-S. Spectrographic Analysis of Low-Alloy Steel—a Plate Calibration Technique Based on Relative Intensities of Standard Iron Lines. T. G. Shamanna and N. P. Gandhi. *Indian Institute of Metals, Transactions,* v. 8, 1954-55, p. 309-317.

The method of plate calibration commonly used by sparking analyzed standards on each plate has several drawbacks. Another method whereby the photometer deflection ratios are converted into intensity ratios offers distinct advantages and is to be preferred for routine work. Testing the suitability of this method of plate calibration for the analysis of low-alloy steels; description of the technique used and the results obtained which fully confirm the theoretical soundness of the method.
(S11k; AY)

204-S. Spectrographic Analysis of High-Alloy Steels. T. G. Shamanna and P. N. Gandhi. *Indian Institute of Metals, Transactions,* v. 8, 1954-55, p. 319-332.

In the present investigation, the concentration-ratio method is applied for the analysis of high-alloy steels such as high-speed, stainless and toolsteels. The concentration-ratio method essentially consists in taking the variation in the base metal content into account by plotting the log concentration ratio of the alloying elements to the base metal instead of the log percentage of the alloying elements, in drawing the working curves which are employed for the analysis of a number of steels of widely varying composition. (S11k; AY)

205-S. Analysis of Corrosion Products by Paper Chromatography. D. G. Stern and F. Corry. *Metal Treatment and Drop Forging,* v. 24, Mar. 1957, p. 93-97.

Method allows detection of metal in smaller than microgram amounts. Procedure for preparing chromatograms; locating and identifying zones. (S11a, R11)

206-S. The Photometric Determination of Molybdenum in Zinc Cyanide Plating Solutions. J. P. Leftin. *Plating,* v. 44, Apr. 1957, p. 380-382. (CMA)

Molybdenum may be quickly and accurately determined photometrically in zinc cyanide plating solutions, since only small concentrations are present. Small amounts of molybdenum are added to zinc cyanide plating solutions for the purpose of producing a bright zinc plate. The thiocyanate is destroyed and fresh stannous chloride is used to reduce the molybdenum. Butyl carbitol is used to stabilize the color. The preparation of the standard curve is described for the range 0-0.45 oz. per gal. of molybdenum. (S11a, L17a; Zn, *Mo*)

207-S. Plucking Millionths Out of Thin Air. Jack Ritchie. *Tooling and Production,* v. 22, Mar. 1957, p. 83-87.

Description of Fringecount micrometer which employs interferometry in combination with digital counting for measuring directly in number of half wave lengths; instrument gives exceedingly accurate check on dimensions of gage block, plug gages, etc. (S14, X20)

208-S. Gravimetric Determination of Barium in Zirconium Metal and in Certain Zirconium Salts. L. Silverman and K. Trego. *U.S. Atomic Energy Commission,* NAA-SR-1720, Mar. 1956, 17 p. (CMA)

Barium in zirconium and zirconyl chloride may be determined gravimetrically as the sulphate after removing the interfering zirconium and iron. The zirconium is removed by a double precipitation in a 3:1 hydrochloric acid medium and final extraction with cupferron and chloroform. (S11b, *Ba,* Zr)

209-S. Determination of Iron, Chromium, and Nickel by X-Ray Fluorescence, Aqueous Solution Method. Louis Silverman and William W. Houk. North American Aviation, Inc. *U.S. Atomic Energy Commission,* NAA-SR-1788, Mar. 15, 1957, 12 p.

The iron, chromium, and nickel contents in many types of stainless steels were determined by X-ray fluorescence. The fluorescence data were obtained for specific K alpha lines and the intensities were compared to the background intensity reading obtained at 0.6 Å, and the values obtained from a standard plot. The curves obtained for stainless steels are applicable to certain chromium-nickel alloys. (S11p; SS, *Fe, Cr,* Ni)

210-S. Chemical Analysis of Traces of Platinum in 7% Uranium-Zirconium. V. F. Consalvo and J. Rynasiewicz. *U.S. Atomic Energy Commission,* KAPL-M-JR-9, Jan. 24, 1957, 6 p. (CMA)

The acid-insoluble platinum is ashed and dissolved in aqua regia. After some further treatment the platinum is determined colorimetrically by the stannous chloride method. 2 ref. (S11a; U, Zr, *Pt*)

211-S. Gamma Absorptionmetric Sedimentation Analysis in Liquid Metal-Solid Oxide Systems. S. C. Furman. General Electric Co. *U.S. Atomic Energy Commission,* KAPL-1658 (TID-4500, 12th ed.), Jan. 8, 1957, 14 p. $0.20.

A method was developed for determining the concentration and the rate of settling of particulate uranium compounds in NaK or sodium. The method depends on the difference between absorption of gamma radiation by the uranium compound and that by the sodium. (S11f; U)

212-S. Determination of Molybdenum in Uranium-Molybdenum Alloys by Monochromatic X-Ray Absorption. W. C. Dietrich and R. E. Barringer. *U.S. Atomic Energy Commission,* Y-1153, Feb. 21, 1957, 14 p. (CMA)

Uranium alloys with 2-5% molybdenum may be quickly analyzed for the latter by means of monochromatic X-ray absorption. The large excess of uranium seriously attenuates the X-ray beam, so it must be first extracted with tributyl phosphate. Analyses of synthetic samples showed the method to be reliable. (S11p; U, *Mo*)

213-S. Research and Development of Methods of Chemical Analysis for Titanium Metal and Alloys. H. Suss. Watertown Arsenal Laboratory, Report 401/48/A-21. *U.S. Office of Technical Services,* PB 123149, Mar. 1953, 140 p. (CMA)

Status of analytical methods for 29 elements in titanium and titanium alloys. (S11; Ti)

214-S. (Italian.) Testing With Ultrasonics. Dialogue Between a Steelmaker and a Machinist. Aldo Bartocci. *Macchine,* v. 12, Feb. 1957, p. 103-108.

Differing points of view on interpretation of defects revealed by ultrasonic testing; difference between fracture and inclusion; reasons for rejection or utilization of a piece of metal. (S13g; ST)

215-S. (Russian.) Determination of Cadmium in Alloys by the Neutron

Absorption Method. A. P. Ratner, G. R. Rik and A. A. Shebashev. *Primeneniye Mechenykh Atomov v Analiticheskoy Khimii,* 1955, p. 70-74.

Theoretical aspects of analysis based on neutron absorption are expounded. Experimental results are described which show that it is possible to determine cadmium by this method in cadmium-lead alloys when the cadmium content exceeds 2%. Other experimental results show that it is possible to determine the thickness of cadmium coatings on iron when these coatings are more than 10 microns thick.
(S11q; Cd)

216-S. (Russian.) **Determination of Zirconium in Ores by the Iodate Method.** Yu. A. Chernikhov and G. I. Kuchmistaya. *Zavodskaya Laboratoriya,* v. 23, no. 1, 1957, p. 14-18. (CMA)

The ore is decomposed by a mixture of hydrofluoric and sulphuric acid, and the mineral zircon, which remains unattacked by the acids, is filtered off and melted with potassium fluoride. After dissolving the melt in sulphuric acid, zirconium is titrated iodometrically. The composition of the precipitate depends on whether it is amorphous or crystalline: amorphous—$2Zr(IO_3)_4 . KIO_3 . 8H_2O$; crystalline-$2Zr(IO_3)_4 . 5KIO_3 . HIO_3$. 9 ref. (S11j; Zr, RM-n)

217-S. (Russian.) **Sulfuration Method of Determining Oxygen. Oxides in Metals—Pt. 2. Determination of Micro-Amounts of Oxygen in Copper, Nickel, Chromium and Molybdenum.** A. K. Babko, A. I. Volkova and O. F. Drako. *Zavodskaya Laboratoriya,* v. 23, no. 2, 1957, p. 136-140. (CMA)

Molybdenum-nickel alloys, copper or nickel (1-g. samples) are burned in sulphur vapors under vacuum. The metals are converted into sulphides, while oxygen forms sulphur dioxide which is absorbed by water and is then determined colorimetrically with fuchsine-formaldehyde. The sensitivity of the procedure is 10^{-4}%; the duration of the analysis is 5-6 hr. 6 ref.
(S11r; Cu, Ni, Cr, Mo, *O*)

218-S. (Russian.) **Determination of Titanium Nitride in Steel.** Yu. A. Klyachko and M. M. Shapiro. *Zavodskaya Laboratoriya,* v. 23, no. 2, 1957, p. 140-143. (CMA)

Unlike the determination of oxide inclusions in steels, the determination of the metal alone in the inclusions is not sufficient in the case of nitride inclusions because, besides the nitride, there may be present carbonitrides and oxynitrides. It is therefore necessary to supplement the determination of the metal by that of nitrogen. The authors find the amount of nitrogen in titanium nitride included in stainless steels by separation; the inclusion in a precipitate remaining after the electrolytic dissolution of the steel sample, dissolving (nitrides and carbides) in potassium bichromate in the phosphoric and sulphuric acids, and distilling off and measuring the liberated nitrogen.
(S11f; SS, *Ti,* 14-18)

219-S. (Russian.) **Colorimetric Determination of Molybdenum in Steels by the Extraction Method.** F. G. Zharsvskii and E. F. Gavrilova. *Zavodskaya Laboratoriya,* v. 23, no. 2, 1957, p. 143-146. (CMA)

In studying the possibilities of separating various elements by extraction, the authors found a way to separate molybdenum from tungsten, convenient for analytical purposes. The weakly acid solution of the mixture is treated with phenylhydrazine, whereupon molybdenum forms a red compound that is extracted with an organic solvent, such as isoamyl alcohol, and determined colorimetrically. 6 ref.
(S11a; AY, *Mo*)

220-S. (Russian.) **The Problem of the Possibility of Spectral-Analytical Determination of Nitrogen and Oxygen in Titanium.** N. M. Kargan and L. N. Filimonov. *Zavodskaya Laboratoriya,* v. 23, no. 2, 1957, p. 185-187. (CMA)

The authors question the correctness of earlier data which allegedly demonstrated the possibility of a spectral-analytical determination of nitrogen and oxygen in titanium at concentrations not exceeding 1% of the strength on their own results. They deny the possibility of such determination under the experimental conditions adopted, and ascribe the spectral lines observed by earlier investigation to impurities that contaminated their preparations. 2 ref. (S11k; Ti, *O, N*)

221-S. **Spectrophotometric Determination of Zinc and Other Metals with Alpha-, Beta-, Gamma-, Delta-Tetraphenylporphine.** Charles V. Banks and Ramon B. Bisque. *Analytical Chemistry,* v. 29, Apr. 1957, p. 522-528.

Trace amounts of zinc can be determined by utilizing the spectro-

photometric properties of the zinc complex of alpha, beta, gamma, delta-tetraphenylporphine in glacial acetic acid. (S11k; Zn)

222-S. Spectrographic Determination of Lead in Leaded Steel. James E. Paterson. *Analytical Chemistry,* v. 29, Apr. 1957, p. 526-527.

Rapid method for the determination of lead in the 0.15 to 0.35% range. Lead can be determined spectrographically by the procedure described in the range from 0.10 to 0.50%. (S11k; ST, *Pb*)

223-S. Flame Spectrophotometric Determination of Copper, Nickel, and Manganese in Aluminum-Base Alloys. John A. Dean and Carl Cain, Jr. *Analytical Chemistry,* v. 29, Apr. 1957, p. 530-532.

Copper, nickel and manganese can be selectively extracted with chloroform as the metal diethyldithiocarbamates from a buffered aqueous solution containing citrate. The elements can then be determined successively by aspirating the chloroform extract into an oxy-acetylene flame. (S11k; Al, Cu, Ni, Mn)

224-S. Colorimetric Determination of Ruthenium. Samuel B. Knight, Ross L. Parks, Sarah C. Leidt and Kenneth L. Parks. *Analytical Chemistry,* v. 29, Apr. 1957, p. 571-574.

A spectrophotometric study of six sulphur-containing compounds which form complexes with the platinum metals. One of the compounds, sigma-diphenylthiourea, has favorable colorimetric properties as a reagent for ruthenium and its stability of color, specificity for ruthenium, and compatibility with the other platinum metals have been studied in detail. 12 ref. (S11a; Ru)

225-S. Detection of Traces of Iron. Fritz Feigl and Alcides Caldas. *Analytical Chemistry,* v. 29, Apr. 1957, p. 580-582.

Soluble or insoluble compounds of trivalent iron give the characteristic red color of bivalent iron when they react with a solution of 2,2'-bipyridine or 1,10-phenanthroline in thiogylcolic acid. 11 ref. (S11; Fe)

226-S. Ferrous Metallurgy. H. F. Beeghly. *Analytical Chemistry,* v. 29, Apr. 1957, p. 638-643.

Developments in the analytical chemistry of ferrous metals and nonmetallic compounds; colorimetry, potentiometry, polarography, mass spectrometry and X-ray analysis. (S11; Fe, ST)

227-S. Nonferrous Metallurgy. M. L. Moss. *Analytical Chemistry,* v. 29, Apr. 1957, p. 670-678.

Review of methods of sampling, preliminary treatment and separations; colorimetry, potentiometry, polarography, fluorimetry and mass spectrometry. 271 ref. (S11; EG-a)

228-S. Detection of Weld Flaws in Chain Links. J. Deakin. *British Safety in Mines, Research Establishment,* Research Report No. 135, Oct. 1956, 31 p.

Purely visual methods of inspection after manufacture or during service are shown to have been inadequate in many of the samples investigated. Radiographic, magnetic and electrical, and acoustic methods of nondestructive testing as applied to the various kinds of chain. 9 ref. (S13, T7e)

229-S. The Separation of the Lanthanons With the Aid of Ethylenediaminetetra-Acetic Acid ("Enta Acid"). Pt. VI. Ion-Exchange Studies of the Heavy and Middle Lanthanons and Yttrium. J. K. Marsh. *Chemical Society Journal,* no. 1957, Mar. 1957, p. 978-982. (CMA)

Good yields of purified heavy and middle lanthanons were obtained with a cation exchanger of sulphonated polystyrene and an elutriant of ammonium-buffered EDTA, but separation of dysprosium from yttrium is difficult. The crude is separated into three mixtures and these are re-run to give the pure lanthanons. Procedural details are given. (S11f, EG-g)

230-S. New Spectrophotometric Method for the Determination of Copper With Sodium Versenate. N. A. Ramaiah and Vishnu. *Indian Academy of Sciences, Proceedings,* Section A, v. 45, Feb. 1957, p. 113-116.

A new method employing the absorption at lambda = 630 millimicrons of copper ammonium complex. 19 ref. (S11a; Cu)

231-S. Detection of Chemical Protective Films on Aluminum and Aluminum Alloys. A. J. Raffalovich and F. Firestone. *Metal Finishing,* v. 55, Apr. 1957, p. 65-67.

Stannic chloride reacts rapidly with untreated aluminum. Slower reaction indicates presence of chromate, phosphate for oxide film. (S11; Al, 8-19)

232-S. Method for Fabrication and Inspection of Alloy Steel Piping. Pt. II. Selecting Equipment. Walter W. Offner. *Petroleum Engineer*, Apr. 1957, p. C31-C44.

Application of standards and tests in selecting pipe. (S22; AY, 4-10)

233-S. A Method for the Determination of Radium in Ores and Residues. J. E. Hudgens, R. C. Meyer, C. Zyskowski and L. C. Nelson. New Brunswick Laboratory. *U.S. Atomic Energy Commission*, NBL-128, Mar. 1957, 19 p. $.20.

Samples were packed into 12-ml. glass vials, the vials sealed and the gamma ray activity of the radium detected after a growth period of 30 days. A high-pressure ionization chamber was used as a detector and the gamma rays were filtered through ⅜ in. of lead to minimize the detection of the low-energy part of the radium gamma ray spectrum. 12 ref. (S19c; Ra, RM-n)

234-S. Methods of Separation of Total Rare Earths in Low-Alloy Constructional Steels: a Bibliography. A. Wennerberg. Armour Research Foundation of Illinois Institute of Technology. *U.S. Office of Technical Services*, OTS 57-41, 157 p. $4.

Chemical methods of separation, fractionation and determination. Studies of chemical and physical properties of rare earths and rare-earth compounds. Ion exchange resins, extraction, precipitations, amalgamations, chromatography, ionic migration, colorimetric and conductometric studies, complex formation, solubility studies, spectrographic studies, paramagnetic susceptibility, activation and X-ray studies, and general literature. (S11; AY, EG-g)

235-S. Selective Standardization and Status of Specifications for Titanium Mill Products. Arthur D. Little, Inc. Battelle Memorial Institute, Report 22. *U.S. Office of Technical Services*, PB 124569, Nov. 1955, 23 p. (CMA)

Selective standardization of titanium mill forms comparable to that of aluminum or magnesium awaits further data derived from experience. The aircraft industry is the vanguard of such standardization for titanium. Aeronautical material specifications for titanium are listed. (S22; Ti, 15-22)

236-S. Determination of Niobium and Molybdenum in Uranium Ternary Alloys. G. W. C. Milner, G. A. Barnett and A. Bacon. British Atomic Energy Research Establishment, C/R 1805. *U.S. Office of Technical Services*, PB 119653, 1956, 15 p. (CMA)

Determination of columbium and molybdenum in uranium-base alloys is described. The molybdenum content is determined by a preliminary solvent extraction into hexone with 10 M HF, and 6 M H_2SO_4 and 2.2M NH_4F, followed by extraction into an aqueous phase of H_2O_2, evaporation to fumes of H_2SO_4 and separation into portions for determining columbium and molybdenum. The latter portion has thiocyanate added. The molybdenum thiocyanate complex formed is compared in absorbency with molybdenum standard. (S11f; U, *Cb, Mo*)

237-S. Detection of Internal Defects in a Large Forging Blank by Ultrasound. F. I. Mikhailov. *Henry Brutcher Translation* no. 3863, 5 p. (From *Vestnik Mashinostroeniya*, v. 36, no. 2, 1956, p. 60-64.) Henry Brutcher, Altadena, Calif.

Previously abstracted from original. See item 226-S, 1956. (S13)

238-S. Determination of Rare Earths in Steel. H. Krapp. *Henry Brutcher Translation* no. 3864, 3 p. (From *Archiv Eisenhuttenwesen*, v. 27, no. 2, p. 103-105.) Henry Brutcher, Altadena, Calif.

Previously abstracted from original. See item 222-S, 1956. (S11, ST, EG-g)

239-S. Spectro-Analysis of Steel for Oxygen. O. B. Fal'kova. *Henry Brutcher Translation* no. 3884, 2 p. (From *Izvestiya Akademii Nauk SSSR*, v. 19, no. 2, 1955, p. 149-150.) Henry Brutcher, Altadena, Calif.

Arrangement and method, based on making the specimen one of the electrodes of a powerful discharge system excited in a hydrogen atmosphere at 270 mm. Hg. Oxygen line used. (S11k, ST, *O*)

240-S. (English.) **Studies on Flame Spectrochemical Analysis. Pt. V. Determination of Manganese.** Shigero Ikeda. *Tohoku University, Science Reports of the Research Institutes*, v. 8A, Dec. 1956, p. 449-456.

Manganese revealed its spectral line at 403.4 millimicrons when it was excited by oxygen-hydrogen flame and its intensity was measured. The intensity of this line was affected by various factors. Alkali metals and alkali earth met-

als intensified the manganese emission, while aluminum, copper, chromium and nickel weakened it. On the basis of these results the rapid determination of manganese in ferromanganese alloy was proposed. (S11k; *Mn,* AD-n)

241-S. (English.) **Studies Flame Spectrochemical Analysis. Pt. VI. Determination of Strontium.** Shigero Ikeda. *Tohoku University, Science Reports of the Research Institutes,* v. 8A, Dec. 1956, p. 457-462.

Strontium radiated its spectral line at 460.7 millimicrons at very high intensity. The head of the band spectrum of its oxide was at 681 millimicrons. Alkali metal increased the intensity of strontium emissions and the presence of magnesium or appreciably large amounts of calcium caused the depression of its emission, while a large amount of barium enlarged the intensity of emissions. From the results, strontium in shell and limestone was determined rapidly with good reproducibility. (S11k; Sr)

242-S. (German.) **Determination of Small Aluminum Contents in Steel. Pt. II.** Alfred Neuberger and Ernst Schöffmann. *Archiv für das Eisenhüttenwesen,* v. 28, Feb. 1957, p. 65-66.

Reduction of aluminum losses from 25 to 3% by using the enrichment procedure according to A. Zörner, E. Krath and H. Feucht before applying the sodium hydroxide method. Improvement of analysis. 4 ref. (S11; ST, *Al*)

243-S. (Italian.) **Industrial Inspection of Welds by X-Ray and Quantitative Evaluation of Defects Revealed. Porosity Due to Use of Damp Electrodes in Welding of Steel. Pt. III.** Marco Robba. *Ingegneria Meccanica,* v. 5, Nov. 1956, p. 47-51.

Reference radiographs for quantitative evaluation of porosity. Possible lines of study for further research. (Concluded.) 15 ref. (S13e; ST, 7-1, 9-18)

244-S. (Italian.) **Electrolysis at Controlled Potential in the Analysis of the Leading Copper Alloys.** B. Alfonsi. *Metallurgia Italiana,* v. 49, Feb. 1957, p. 89-94.

Theory of electrolysis at controlled potential, necessary equipment, advantages of this technique compared to those of the constant intensity technique. The main applications deal with the analysis of copper alloys. 11 ref. (S11g; Cu)

245-S. (Book—German.) **Light Metal Analysis.** Hans Ginsberg. 285 p. 1955. Walter DeGruyter and Co., Genthiner Strasse 13, Berlin, Germany. DM 24.80.

General discussion of sampling and preparation for chemical and spectro-analysis; dissolving of samples; test methods and instruments. Specific metals discussed are aluminum, beryllium, manganese and titanium. (S11, EG-a, Al, Be, Mn, Ti)

246-S. **Determination of Thorium and Lanthanons in Monazite.** J. Clinch and E. A. Simpson. *Analyst,* v. 82, Apr. 1957, p. 258-269. (CMA)

Oxalic acid is shown to be unsatisfactory as a group precipitant for the lanthanons and thorium when they are determined in monazite because of solubility losses. These losses are reduced when the precipitant is ammonium oxalate. A double oxalate precipitation is followed by the precipitation of thorium as the benzoate and the precipitation of the lanthanons as hydroxides. The precision and coefficients of variation are discussed. (S11j; Th, EG-f)

247-S. **Spectrophotometric Determination of Copper in Titanium.** A. J. Frank, A. B. Goulston and A. A. Deacutis. *Analytical Chemistry,* v. 29, May 1957, p. 750-754. (CMA)

A procedure for determining copper in steel (chloroform-alcohol extraction of the cuprous neocuproine complex) has been successfully applied to copper in titanium. Copper is then estimated spectrophotometrically. Chromium is the only serious interference and may be eliminated by complexing Cr(III) with sulphite. The sulphuric-fluoboric procedure is cited as the best method of dissolving titanium; hydrolytic separation of titanium is unlikely. 16 ref. (S11a; Ti, *Cu*)

248-S. **Colorimetric and Gravimetric Determination of Silicon in Titanium and Titanium Alloys.** M. Codell and G. Norwitz. *Analytica Chimica Acta,* v. 16, Apr. 1957, p. 327-332. (CMA)

Errors in the "molybdenum blue" method of determining silicon in titanium alloys are discussed. Improved colorimetric and gravimetric methods are proposed. In the former the sample is dissolved in HF, H_3BO_3 is added and oxidation is effected with H_2O_2 and permaganate.

Most of the titanium is precipitated by heating in boiling water and the "molybdenum blue" is developed at 23° C. and read spectrophotometrically. In the gravimetric method the sample is fumed with H_2SO_4, the silica is ignited and then fused with sodium carbonate. $HClO_4$ is used for dehydration. The colorimetric method is best up to 1.5% Si and the gravimetric down to 0.3% Si. (S11a, S11b; Ti, *Si*)

249-S. Eddy Current Electrical Conductivity Measurement as an Analysis for Molybdenum in Binary Molybdenum-Uranium Alloys. R. E. Cofield. *U.S. Atomic Energy Commission,* Y-1152, Feb. 15, 1957, 32 p. (CMA)

Following a discussion of the principles and problems involved in measuring the electrical conductivity of a solid by the eddy current method, the results of applying the method to determining molybdenum in 2% Mo uranium alloys are reported. Chemical and conductivity analyses were compared and agree well. It is necessary that the eddy current conductivity meter be calibrated by use of chemically analyzed test objects. Analyses are performed accurately in 1 min. or less. 47 ref. (S11g, P15g, 1-2; U, *Mo*)

250-S. Prediction of X-Ray Absorption Characteristics of a U-Zr Alloy Fuel Element. W. R. Plant. *U.S. Atomic Energy Commission,* KAPL-M-RCD-20, Apr. 26, 1957, 8 p. (CMA)

A study of the X-ray absorption of 41.75% Zr uranium fuel elements shows that inhomogeneities may be revealed by the radiographic process when densitometric methods are used. The limit of sensitivity appears to 0.5-0.8% when applied to a gradual change along the element. (S13e, T11g, 17-7; U. *Zr*)

251-S. (French.) **Fractionation of Rare Earths by Means of Ethylenediaminetetraacetic Acid.** G. Brunisholz. *Chimia,* v. 11, Apr. 18, 1957, p. 97. (CMA)

Ethylenediaminetetraacetic acid (E) and rare earths (R) form together complex anions (ER) whose alkali or ammonium salts (e.g., $NH_4(ER)$ or K(ER)), crystallize with varying amounts of water of crystallization and in different, nonisomorphous forms. Accordingly, systems involving several rare earths will present gaps in the miscibility of solid phases. For such cases the phase theory offers the possibility of foreseeing successful fractionation cycles. Thus, from a mixture of rare earths of the cerium series containing 8.5 at. % Pr, 35% Nd, 8% Sa and 48.5% La the authors, using ammonium salts, obtained a first fraction of pyramidal crystals composed of 11 at. % Pr, 12% Nd, 11% Sa and 26% La, then a second fraction of needle-like crystals containing 6 at. % Pr, 12% Nd, 1% Sa and 81% La; the mother liquor was returned to the cycle. In a similar way mixtures of elements of the yttrium series can be fractionated by means of ammonium salts. 3 ref. (S11f; EG-g)

252-S. (German.) **Use of Complexones in Chemical Analysis. Pt. LI. Colorimetric Determination of Cerium in Magnesium Alloys.** M. Malinek and L. Klir. *Collection of Czecoslovak Chemical Communications,* v. 22, Feb. 1957, p. 319-322.

The presence of manganese interferes with the color effects of the known colorimetric methods for the determination of cerium. A color reaction of cerium is described which is not disturbed by the presence of manganese and can, therefore, be applied for a direct determination of cerium, not requiring its separation from manganese. It consists in an oxidation of tetravalent cerium with hydrogen peroxide in an ammonia solution and in the presence of complexone. While bivalent manganese remains bound to complexone, the oxided cerium forms a compound of a transient yellow-to-brown color that can be measured. 8 ref. (S11a; Mg, *Ce*)

253-S. (Russian.) **Determination of High-Dispersion Carbides of Vanadium, Molybdenum and Titanium.** N. M. Popova, A. F. Platonova, L. V. Zaslavskaya and M. F. Rybina. *Zavodskaya Laboratoriya,* v. 23, no. 3, 1957, p. 269-272. (CMA)

The usual procedure of separating carbides in steel by boiling steel chips in acids is not suitable for the case of highly dispersed carbides of vanadium, molybdenum and titanium, since they partially dissolve in acids. The authors developed procedures for determining such carbides in precipitates obtained by anodic dissolution of steel in Kel: (*a*) the precipitates are treated for several hours with boiling 0.5% hydrochloric acid, sometimes in the presence of alcohol (as a surface-

active agent), whereby the high-dispersion phase becomes dissolved; (*b*) by boiling the precipitate in alcohol solution of hydrogen peroxide, cementite remains in the precipitate while special carbides dissolve. These methods were applied to the study of the problem of the secondary strengthening, acquired by steels through annealing and attributed to the formation of high dispersion carbides. A correlation between the degree of strengthening and the amount of such carbides was actually observed. 4 ref. (S11; ST, *V, Mo, Ti,* 14-18)

254-S. Non-Destructive Testing in the Control of Quality of Non-Ferrous Castings. S. L. Fay. *Institute of Metals, Journal,* v. 85, Apr. 1957, p. 361-366.

Briefly reviews visual inspection, liquid penetration, pressure testing, ultrasonic testing and fluoroscopy; gives detailed considerations to radiography; covers factors affecting quality of radiographs and radiographic procedure; discusses and illustrates defects revealed by method. (S13; EG-a, 5)

255-S. An Improved Method for the Simultaneous Determination of Aluminium, Copper and Magnesium in Zinc Alloys by Spectrographic Method. B. C. Kar, M. K. Gupta and V. Muthukrishnan. *Journal of Scientific and Industrial Research,* v. 16B, Jan. 1957, p. 27-31.

An improved spectrographic method which employs the porous cup-spark technique and the plate calibration method is described for the simultaneous determination of aluminum, copper and magnesium in zinc-base alloys. The method is speedy and the elements were determined with an accuracy of 3%. 9 ref. (S11k; Zn, *Al, Cu, Mg*)

256-S. Use of Atomic Energy in the Testing of Materials. W .M. Keller. *Mechanical Engineering,* v. 79, Mar. 1957, p. 258-260.

Inexpensive radiosotopes offer possibilities for nondestructive inspection. Possibilities in railroad testing are discussed. (S general; 14-13)

257-S. Applications of Nondestructive Testing to Fuel Elements for Nuclear Reactors. W. J. McGonnagle and E. C. Wood. *Nondestructive Testing,* v. 15, Mar-Apr. 1957, p. 86-90.

Applications of various nondestructive tests to check bond integrity, weld integrity, tubing, clad thickness, and grain size and orientation in the fuel elements of nuclear reactors are discussed. The isothermal frost test is described in detail. (S13, S14, M27c, T11g)

258-S. Inspection of Small-Diameter Tubing by Eddy-Current Methods. J. W. Allen and R. B. Oliver. *Nondestructive Testing,* v. 15, Mar-Apr. 1957, p. 104-109.

What can be accomplished with eddy-current tests on nonferromagnetic small-diameter tubing according to present-day methods and what may be expected in the near future. (S13c; 4-10)

259-S. An Evaluation of the Application of Thulium-170 to Industrial Radiography. James W. Dutli and Dana Elliott. *Nondestructive Testing,* v. 15, Mar-Apr. 1957, p. 112-114.

Thulium-170 is suitable for radiography of very thin metal sections. The light weight and the compactness of the unit should make it applicable in many cases where X-ray generators cannot be used because of space limitations or economy. (S13e, 1-3; Tm, 14-13)

260-S. Fatigue Strength of Bolts Reduced by Longitudinal Flaws. Joseph Viglione. *Product Engineering,* v. 28, Mar. 1957, p. 203-205.

Longitudinal flaws which are difficult to find and are not readily visible may be important as a source of failure. Circular magnetization is used for detection. (S13h, Q7a, T7f, 17-7)

261-S. Spectrophotometric Estimation of Uranium With Tiron. B. Sarma and C. P. Savariar. *Scientific and Industrial Research, Journal,* v. 16B, Feb. 1957, p. 80-82.

A spectrophotometric method for the estimation of semi-micro quantities of uranium up to 400 ppm. Uranium forms a highly soluble brown complex with tiron (disodium cathechol disulphonate.) 5 ref. (S11a; U)

262-S. Tantalum Determination. R. W. Moshier and J. E. Schwarberg. Wright Air Development Center, Technical Report 56-300. *U.S. Office of Technical Services,* PB 121819, June 1956. 39 p. (CMA)

A schedule for analysis of mixtures containing titanium, zirconium, columbium, tantalum, molybdenum and tungsten has been developed, and

the separation of the first four from the latter two metals has been improved. A reagent has been developed for separating tantalum from titanium and zirconium.
(S11f; Ta, Ti, Zr)

263-S. (English.) **Polarographic Determination of Arsenic in Lead Metal.** Hidehiro Goto and Shigero Ikeda. *Tohoku University, Science Reports of the Research Institutes.* v. 9-A, Apr. 1957, p. 91-96.

Polarographic studies of arsenic in various supporting electrolytes were made and the method for the polarographic determination of arsenic was established. Polarographic determination of 0.003 to 0.1% arsenic in lead could be made. (S11m; Pb, *As*)

264-S. (English.) **Polarographic Determination of Tin and Antimony in Iron and Steel.** Hidehiro Goto, Shigero Ikeda and Shiro Watanabe. *Tohoku University, Science Reports of the Research Institutes,* v. 9-A, Apr. 1957, p. 97-106.

For the estimation by polarography of small amounts of tin and antimony contained at impurities in iron and steel, it was necessary to eliminate the effect of interference of iron. These impurities were, therefore, separated from iron by coprecipitating with manganese dioxide. 0.02 to 0.1% tin and 0.005 to 0.1% antimony in iron and steel could be determined.
(S11m; Fe, ST, *Sn, Sb*)

265-S. (English.) **Electrolytic Determination of Lead in Iron and Steel.** Hidehiro Goto and Yachiyo Kakita. *Tohoku University, Science Reports of the Research Institutes,* v. 9-A, Apr. 1957, p. 131-137.

Studies were made on the application of electrolytic deposition of lead as lead dioxide for the determination of lead in iron and steel. The influences of some diverse ions were also investigated and a suitable procedure for the routine analysis of iron and steel was established.
(S11; Fe, ST, *Pb*)

266-S. (English.) **Determination of Micro-Amounts of Calcium, Magnesium and Aluminium in Titanium Metal.** Hidehiro Goto and Shuro Takeyama. *Tohoku University, Science Reports of the Research Institutes,* v. 9-A, Apr. 1957, p. 138-146.

Satisfactory results were obtained by extracting titanous thiocyanate with ether. Photometric determination was carried out after separation by using chlorophenol azodihydroxynaphthalenesulfonate for calcium, titan yellow for magnesium and extraction of the oxine for aluminum. (S11a; Ti, *Ca, Mg, Al*)

267-S. (French.) **Sampling for the Determination of Hydrogen Content of Steel and Cast Iron.** E. Piper and H. Hagedorn. *Metallurgie et la Construction Mecanique,* v. 89, Apr. 1957, p. 329-333.

Test sampling and method adopted for detecting hydrogen and measuring its quantity. Comparison of three methods of taking samples.
(S12h, S11; ST, CI, *H*)

268-S. (French.) **Sensitometric Determination of the Best Conditions for Use of Radioactive Sources in the Gamma-Ray Examination of Steel.** H. De Leiris and E. Antoni. *Soudage et Techniques Connexes,* v. 11, Mar-Apr. 1957, p. 83-92.

Through the methodical measurement of the extent of darkening under varying conditions it is possible to work out exposure formulas which, represented on charts, give the time of exposure involved in particular cases. By comparison of these formulae, various emulsions are classified to be used as a guide for the selection of an emulsion as a function of the type of inspection to be made. The image quality indicator makes it possible to determine the best conditions governing the use of radioactive sources in relation to steel thickness. 3 ref.
(S13e, 1-3; ST)

269-S. (Swedish.) **Sampling Methods for Hydrogen Determination in Steel.** Lars Bjerkerud. *Jernkontorets Annaler,* v. 141, no. 2, 1957, p. 94-99.

Samples taken from both ladles and molds; analyses on ground and unground specimens compared.
(S12h; ST, *H*)

270-S. Polarographic Determination of Arsenic in Zinc-Smelting Residuals and Zinc Metal. R. E. Coulson. *Analyst,* v. 82, Mar. 1957, p. 161-164.

A simple method developed for the determination of 0.1 to 5% of arsenic in residuals arising from the production of zinc from sulphide ores. 3 ref. (S11m; Zn, *As*)

271-S. Determination of Uranium by Ammonium Thiosulphate and Sodium Hypophosphite. H. N. Ray and N. P. Bhattacharayya. *Analyst,* v. 82, Mar. 1957, p. 164-166.

Uranium is determined gravimetrically by precipitation as the greenish phosphate from dilute mineral-acid solution by means of sodium hypophosphite and ammonium thiosulphate. The method has been successfully applied to the determination of uranium in steel. 4 ref. (S11b; ST, *U*)

272-S. Photometric Determination of Arsenic and Phosphorus in Copper-Base Alloys. H. C. Baghurst and V. J. Norman. *Analytical Chemistry*, v. 29, May 1957, p. 778-782.

Determination of arsenic by the formation of a mixed heteropoly acid with molybdenum and vanadium; the factors influencing formation of the complex were examined, and conditions designed to give results independent of temperature from 17 to 35° C. were established. Method was then extended to permit simultaneous determination of both arsenic and phosphorus in deoxidized copper without prior separation. 6 ref. (S11a; Cu, *As, P*)

273-S. Thermolysis of Thorium Precipitates. Salts of Organic Acids. Wesley W. Wendlandt. *Analytical Chemistry*, v. 29, May 1957, p. 800-802.

Thermal decomposition of the thorium precipitates with stearic, pyrogallic, m-hydroxybenzoic, m-cresoxy-acetic, benzoic, 2,4-dichlorophenoxy-acetic, phenylacetic, cinnamic, and oaminobenzoic acids and mercapto-thiazole were studied on the thermo-balance. 13 ref. (S11b; Th)

274-S. Spectrophotometric Determination of Tungsten in Tantalum, Titanium, and Zirconium Using Dithiol. P. Green. *Analytical Chemistry*, v. 29, June 1957, p. 896-898. (CMA)

Tungsten may be determined in titanium, zirconium and tantalum as the dithiol complex. The blue-green color is retained through the extraction with amyl acetate and measured spectrophotometrically. The samples are dissolved with HF-HNO_3. Molybdenum can be extracted sequentially before tungsten by dithiol using 4N HCl and $SnCl_2$; the reductant for tungsten is $TiCl_3$. (S11a; Ta, Ti, Zr, *W*)

275-S. Determination of Zirconium in Steel. Direct Spectrophotometric Method. R. B. Hahn and J. L. Johnson. *Analytical Chemistry*, v. 29, June 1957, p. 902-903. (CMA)

Small amounts of zirconium in steels may be determined by spectrophotometric measurement of the absorbance of the chloranilate at 330 mμ (for amounts under 0.1%) or 525 mμ. Interfering ions are removed by electrolysis with a mercury cathode. The results agree well with those from the methods using p-dimethylaminoazobenzenearsonic acid and mandelic acid. 10 ref. (S11k; ST, *Zr*)

276-S. Thoron-Meso-Tartaric Acid System for Determination of Thorium. M. H. Fletcher, F.S.E. Grimaldi and L. B. Jenkins. *Analytical Chemistry*, v. 29, June 1957, p. 963-967. (CMA)

The thoron determination of thorium in zircon and zircon-containing minerals is simplified by masking zirconium with meso-tartaric acid. A study of the variables covers reagent concentrations, temperature, diverse ion effects and time. The substitution of meso-tartaric acid for d-tartaric acid permits a direct spectrophotometric determination of thorium. A dilution procedure is given. (S11; Th)

277-S. Application of Non-Destructive Testing to Castings. C. W. H. du Toit. *Engineer and Foundryman*, v. 21, Feb. 1957, p. 58-63.

Nondestructive testing for gas holes, gas porosity, shrinkage, heterogeneities. (S13; 5, 9-18)

278-S. "Autosonics" Flaw Detection. Continuous-Scan Ultrasonic Inspection. *Engineering*, v. 183, Mar. 22, 1957.

Gap-spanning installation for the automatic detection of lamination in steel plate. (S13g; ST)

279-S. Detection of Internal Flaws in Rails by Ultrasonic Methods. Jean Palme. *Inspection Engineer*, v. 20, July-Aug. 1956, p. 86-89.

Principles of ultrasonic inspection, operation of equipment and the reliability of tests. (S13g, 1-2, T23q)

280-S. Inspection of Drop Forgings. H. J. Merchant. *Inspection Engineer*, v. 20, Nov-Dec. 1956, p. 129-133.

Brief statement on inspection of drop forgings from an engineering viewpoint, including preliminary, processing and final inspection. Highly integrated with these is the inspection of drop forgings from a metallurgical viewpoint which comprises material acceptance, maintenance of material identity, maintenance of correct standards of me-

chanical manipulation and thermal treatment and the mechanical testing of the forged product.
(S general, F22n)

281-S. Destructive and Non-Destructive Testing. F. T. Galton. *Inspection Engineer,* v. 21, Jan-Feb. 1957, p. 10-14.

Types of tests defined and described. (S general, Q general)

282-S. Development of Methods for the Chemical Determination of Uranium. T. W. Steele. *South African Institute of Mining and Metallurgy, Journal,* v. 57, Nov. 1956, p. 144-152.

Analytical methods evaluated by the South African Government Metallurgical Laboratory. 12 ref.
(S11; U)

283-S. Determination of Uranium Dioxide in Stainless Steels by the X-Ray Fluorescence Method. Louis Silverman, William W. Houk and Lavada A. Moudy. Atomics International, *U.S. Atomic Energy Commission,* NAA-SR-1848, Apr. 15, 1957, 11 p.

A rapid method using strontium as internal standard. 6 ref.
(S11p; SS, *U*)

284-S. (Czech.) **Use of Ultrasonics in Testing of Large Forgings.** Vladimir Koblovsky. *Hutnické Listy,* v. 12, Apr. 1957, p. 302-309.

In ultrasonic testing there occur cases when the actual prescribed tests are satisfactory, but indications of ultrasonic testing show the presence of hidden defects. This is shown on forgings of three rotors, which were rejected at the works, and afterwards examined in detail to confirm the ultrasonic indications. 6 ref. (S13g; ST, 4-1)

285-S. (Czech.) **Ultrasonic Tests of Turbine and Generator Rotors.** K. Slonek. *Materialovy Sbornik,* 1956, p. 157-168.

Describes the testing device, the testing methods and the results of ultrasonic tests made on turbine and generator rotors; results show that it is possible to detect every serious defect inside the rotor (holes not closed by forging, inclusions, cracks and flaky spots). 6 ref.
(S13g, T7h; 1-3)

286-S. (French.) **Definition and Control of the Quality of a Metal.** Marcel Prot. *Courrier de la Normalisation,* v. 24, Feb. 1956, p. 45-48.

French Standards Association issues three specifications concerning quality, quality control and inspection. Comments on responsibilities of suppliers, tests by buyers and miscellaneous problems of quality control. (S22)

287-S. (Japanese.) **Quantitative Determination of Zinc in Zinc Ore by Disodium Ethylenediaminetetra-Acetate. (EDTA).** Ato, Kisei Tanahashi and Isamu Watanabe. *Kagah Kenkyusho Hokoku,* v. 33, Jan. 1957, p. 24-33.

Procedures; effect of ammonium chloride, and silicic acid.
(S11; Zn, RM-n)

288-S. Principal Types of Cast Iron and Broad Spheres of Application. J. G. Pearce. *British Cast Iron Research Assoc. Journal of Research and Development,* v. 6, Apr. 1957, p. 521-529.

Classification of cast irons in relation to mechanical requirements of British Standard specifications covering general gray iron castings, whiteheart and blackheart malleable castings and the nodular cast irons. Reference is made to deleterious effect on castings of certain trace elements present in scrap or raw materials. (S22, 1-10; CI-n, 15-5)

289-S. Applications of X-Ray Emission Spectrometry to Rock and Ore Analysis. G. R. Webber. *Canadian Mining and Metallurgical Bulletin,* v. 50, Apr. 1957, p. 222-227.

General principles of X-ray emission spectrometry; covers sample preparation, procedure and results obtained on analysis of rocks for iron, titanium, calcium and potassium or for columbium. 19 ref.
(S11c; RM-n)

290-S. Non-Destructive Techniques in Refinery Inspection. P. W. Sherwood. *Corrosion Technology,* v. 4, May 1957, p. 148-151.

Application in determining survival life of installed equipment which may be exposed to mechanical wear, erosion or corrosion and in locating obstructions which may form in pipelines and other equipment. (S general, Q9, R11)

291-S. Continuous Gauging of Hot-Rolled Steel Strip. *Engineer,* v. 203, Apr. 12, 1957, p. 573-574.

A gamma-ray thickness gage for measuring thickness of hot rolled steel strip as it passes from the rolls. (S14e, F23, 1-16; ST)

292-S. Roughness of Pre-Treated Surfaces. H. Bablik, F. Gotze and E. Nell. *Industrial Finishing,* v. 9, May 1957, p. 582-584.

Investigation into the roughness of various preheated surfaces and its importance for hot dipping. (S15, L16)

293-S. Use of Gamma Rays for Continuous Inspection. A. Kohn. *Iron and Coal Trades Review,* v. 174, May 3, 1957, p. 1015-1018.

Semifinished products at rolling temperatures examined by scintillation counters that measure gamma-ray activity for the detection of cavities. (S13e, X27c, 1-2)

294-S. Automatic Processes in Strip Rolling. S. S. Carlisle. *Metal Industry,* v. 90, May 10, 1957, p. 389-390.

Principles of automatic gage control to single-stand mills and tandem mills. 11 ref. (S14, W23c, 1-2)

295-S. Determination of Copper in Nickel Solutions. Thomas A. Downey. *Plating,* v. 44, Apr. 1957, p. 383-385.

Colorimetric procedure using absorbants of copper, neo-cuproine complex in ethanolchloroform solution for determination of copper. Method successfully used for checking copper in Watts' nickel plating solution. 4 ref. (S11a; L17a; Ni, *Cu*)

296-S. Ultrasonic Flaw Evaluation. W. C. Hitt. *Western Machinery and Steel World,* v. 48, Apr. 1957, p. 95-99.

Summarizes results obtained by 20 companies using step-type reference test block system of flaw evaluation for immeresd ultrasonic testing of extruded and forged materials. (S13g, 1-4; 4-1, 4-8)

297-S. Notes on the Chemical Determination of Nitrogen in Chromium. E. J. Lumley. *Australian Aeronautical Research Laboratories, Metallurgy Note,* ARL/MET. 7, Feb. 1957, 10 p.

The acid solution distillation method. 4 ref. (S11j; Cr, *N*)

298-S. Flame Photometric Determination of Caesium in Bismuth and Bismuth-Uranium Alloy. P. C. Wildy. *British Atomic Energy Research Establishment,* A.E.R.E. C/R 2114, 1956, 11 p.

Method for determination of cesium in bismuth and bismuth-uranium alloy using an image converter flame photometer. The precision over the range 1 to 5% cesium is better than 5% and over the range 0.20 to 1% cesium is approximately 10%. The limit of sensitivity is 0.02%. (S11a; Bi, U, *Cs*)

299-S. Impurity Analysis of Aluminium by Radioactivation and Scintillation Spectrometry. P. Iredale. *British Atomic Energy Research Establishment,* A.E.R.E. EL/M 96, 1957, 13 p.

Specimens of aluminum were irradiated in a flux of thermal neutrons and the identities of those impurities producing γ-rays when activated were established by measurements of γ-ray energy and of half life. In this way small amounts of impurities were detected while avoiding chemical separation. 4 ref. (S11q; Al, 9-1)

300-S. Local Analysis of Welds in High-Alloy Steels and Hot Strength Alloys. A. G. Komarovskii. *Henry Brutcher Translation* No. 3885, 2 p. (From *Izvestiya Akademii Nauk SSSR,* Ser. Fiz., v. 19, no. 2, 1955, p. 152-153.) Henry Brutcher, Altadena, Calif.

Special generator for localized spectrochemical analyses, providing a variety of discharge conditions, such as high-frequency spark, a powerful condensed low-voltage spark, a high-intensity arc discharge on A.C., and the usual arc and spark discharges, by simple switch manipulation. (S11k, 1-3; SS, 1-7)

301-S. Direct Titration of Calcium and Magnesium in Openhearth and Blast-Furnace Slags With the Disodium Salt of Ethylene-Diaminetetracetic Acid. I. N. Bazilevskaya. *Henry Brutcher Translation* No. 3896, 2 p. (From *Zavodskaya Laboratoriya,* v. 22, no. 2, 1956, p. 166-167.) Henry Brutcher, Altadena, Calif.

CaC values obtained on blast furnace slag with disodium salt of ethylene-diaminetetracetic acid as compared with permanganate; and MgO values obtained with and without separation of calcium. (S11j; RM-q, *Ce, Mg*)

302-S. Colorimetric Determination of Phosphorus in 10-20% Chromium Steels. E. A. Nechaeva and E. S. Lapidus. *Henry Brutcher Translation* No. 3897, 1 p. (From *Zavodskaya Laboratoriya,* v. 22, no. 4, 1956, p. 418.) Henry Brutcher, Altadena, Calif.

Simplification and improvement of Kokorin's method for phosphorus in heat resisting steels with 0.015 to 0.035% phosphorus, using a cobalt salt instead of silver as catalyst. (S11a; SS, *P*)

303-S. Spectrochemical Determination of Nitrogen, Hydrogen, and Oxygen in Titanium and Titanium Alloys. N. S. Sventitskii. *Henry Brutcher Translation* No. 3899, 6 p. (From *Zavodskaya Laboratoriya,* v. 22, no. 6, 1956, p. 668-673.) Henry Brutcher, Altadena, Calif.

Previously abstracted from original. See item 460-S, 1956. (S11; Ti)

304-S. Application of Objective Photometric Interpolation to the Determination of Elements in High Concentrations in the Spectroanalysis of Multi-Component Alloys. I. A. Grikit. *Henry Brutcher Translation* No. 3905, 3 p. (From *Zavodskaya Laboratoriya,* v. 22, no. 2, 1956, p. 196-198.) Henry Brutcher, Altadena, Calif.

Possibility of running rapid analyses on a heat of steel or alloy containing up to 18 different elements, by combining subjective (for 10-15 elements in low concentration) and objective (for 2-3 elements in high concentration) photometric interpolation, while the heat is still in the furnace. (S11a; AY)

305-S. Determination of Small Contents of Aluminum in Steel. Pt. II. A. Neuberger and E. Schoffmann. *Henry Brutcher Translation* No. 3934, 2 p. (From *Archiv Eisenhuttenwesen,* v. 28, no. 2, 1957, p. 65-66.) Henry Brutcher, Altadena, Calif.

Adoption of a method of concentration proposed by Zörner and coworkers, to reduce the aluminum loss in authors' caustic soda procedure from 25 to 3% and insure a correspondingly higher accuracy of the aluminum determination.
(S11; ST, *Al*)

306-S. (French.) **Quality Control at the Westinghouse Columbus Plant.** *Galvano,* no. 243, Apr. 1957, p. 33-37.

Rigid control is exercised at each stage in the production of Westinghouse refrigerators from the checking of alloy content, tensile strength and surface conditions prior to manufacture to the inspection of all shearing, stamping, forming, welding, finishing, assembly and packing operations.
(S general, T10c, G general)

307-S. (French.) **Utilization of Pyrometers in the Founding of Copper Alloys.** *Journal d'Informations Techniques des Industries de la Fonderie,* no. 85, Mar. 1957, p. 5-7.

Arguments for and against the use of pyrometers. Pointers for the precise determination of temperature, the correct moment for casting and the achievement of optimum cleanliness. (S16n, E general; Cu)

308-S. (French.) **Measurement and Control of Temperature in Heat Treatment Plants.** Marcel Boyer. *Trempe,* no. 33, Apr. 1957, p. 21-35.

Survey of pyrometric and thermocouple equipment currently in use: thermo-electric pyrometers, optical pyrometers, electronic pyrometers, thermocouples; function and operation of this equipment. 12 ref.
(S16j, S16n, 1-2, J general)

309-S. (Japanese.) **Rapid Quantitative Analysis of Iron in Copper and Copper Alloys.** Tatsuro Murakami. *Japan Analyst,* v. 6, 1957, p. 172-173.

Procedures for spectrographic analysis; effect of temperature and interferences. 5 ref. (S11c; Cu, *Fe*)

310-S. (Italian.) **Some Considerations on the Interpretation of Ultrasonic Examinations.** E. Marianeschi and T. Tili. *Metallurgia Italiana,* v. 49, Apr. 1957, p. 275-289.

Basic theoretical aspects of ultrasonic testing are summarized and discussed; specific acoustic impedance; reflection; scattering; diffraction; simultaneous influence of frequency, acoustic impedance and effect of target size on the intensity of reflected energy. Some experimental results taken from routine inspection are explained with the aid of the above-mentioned theoretical principles. 14 ref. (S13g)

311-S. Ultrasonic Testing of Aluminum Alloys. William L. Fink. *American Society for Testing Materials,* Preprint 74, 1957, 6 p.

The standardization of ultrasonic testing procedures and instruments for the inspection of aluminum alloy products is described with emphasis upon reproducibility and the correction of ultrasonic indications for metal distance and other disturbing factors. Discusses types of discontinuities most commonly encountered in aluminum alloys and the reflection of ultrasound by them. The latter half of the discussion is devoted to the effect of discontinuities on properties with emphasis upon fatigue life. 3 ref.
(S13g, Q7b; Al)

312-S. Optical Fluorescence in Non-Destructive Testing. W. A. Runciman. *British Journal of Applied Physics,* Supplement No. 6, Physics of Non-Destructive Testing 1957, p. S34-S36.

Magnetic materials can be tested for irregularities on or near the surface by the fluorescent magnetic particle method. Surfaces of any metal can be inspected for cracks by the fluorescent penetrant method. 7 ref. (S13j; SGA-n, 9-22)

313-S. Effects of Penetrating Radiations on Materials. S. F. Pugh. *British Journal of Applied Physics,* Supplement No. 6, Physics of Non-Destructive Testing 1957, p. S36-S39.

Elementary account of changes produced in solids by irradiation. Advance in understanding this subject will further development of nondestructive testing techniques. 24 ref. (S13e, 2-17)

314-S. Where Betatron Inspection Fits in Metalworking. *Iron Age,* v. 179, Apr. 18, 1957, p. 111-113.

Efficiently designed inspection chamber and betatron equipment allows inspection of more steel castings and helps in working out better casting techniques and designs. (S13e, 1-2; ST, 5)

315-S. Autosonics. *Iron and Steel,* v. 30, Apr. 1957, p. 130-149.

Ultrasonic inspection equipment with automatic monitoring and flaw alarm used in regular production testing at Kelvin-Hughes Ltd. (S13g, 1-2)

316-S. How to Test Tool Steels. H. D. Weckener. *Mechanical World and Engineering Record,* v. 141, May 1957, p. 198-201.

To exercise control over deliveries of toolsteel requires metallographic, physical and technological tests. Results of a great number of tests are presented statistically and the conclusions obtained are discussed. 15 ref. (S12; ST)

317-S. Cascade Control for Strip Annealing. *Steel,* v. 140, June 10, 1957, p. 150-153, 156.

Instrument system on continuous strip annealing line monitors temperature and makes corrections for variables in dimensions and speed. (S14, S16, S18n, J23, 1-11; ST)

318-S. Reveals Test Procedures for Atomic Products. Warren J. McGonnagle. *Steel,* v. 140, June 10, 1957, p. 194-201, 204-209, 212.

Testing methods: ultrasonic transmission, helium leak, penetrants, radiography, electrical resistance, methods, some of which employ eddy current and several visual light-sensitive devices. Explains why reactor parts need nondestructive tests. (S13; T11)

319-S. Problems in Steel Specifications. Development of an AISI-SAE Standard Steel. W. R. Miller. *Steel Processing and Conversion,* v. 43, Apr. 1957, p. 208-210.

Development of the SAE codification system and the standardization of steel grades and development of interchangeability between many AISI and SAE standard steels. (S22; ST, 15-19, 15-20)

320-S. Application Guides in Specifying Steels. Joseph Gurski. *Steel Processing and Conversion,* v. 43, Apr. 1957, p. 210-213.

Practices in specifying steels in the range of permissible steel substitution determined at Ford Motor Co. by mechanical properties and manufacturing requirements. (S22; ST)

321-S. Specifications and Steelmaking Problems. D. H. Ruhnke. *Steel Processing and Conversion,* v. 43, Apr. 1957, p. 213-214, 231.

Problems for producer in delivering steels as specified by consumers. The trend toward ordering to hardenability limits, with some relaxation in analysis, has given considerable relief. (S22, J5; ST)

322-S. (German.) **Ultrasonic Testing of Sheets.** Hermann-Josef Kopineck and Hubert Hoff. *Stahl und Eisen,* v. 77, May 30, 1957, p. 727-734.

Use of ultrasonic testing methods in the strip rolling mill; application of the ultrasonic echo, ultrasonic penetration and plate-wave methods according to the type of plant; ultrasonic plate-wave testing of sheets; basic principles of the testing method; requirements to be met by testing plants; details of a testing plant. (S13g; ST, 4-3)

323-S. Blast Furnace Automatic Charging Control Integrated. *Blast Furnace and Steel Plant,* v. 45, May 1957, p. 498-500.

Brief description of new panel board control system which automatically controls processes from the time iron ore, limestone and coke are taken from their bins until material is dumped into the blast furnace. (D1a, 18-24, 1-2)

324-S. Use of Gamma Rays for Continuous Inspection. A. Kohn. *Iron and Coal Trades Review,* v. 174, May 10, 1957, p. 1083-1086.

Detection of cavities in semifinished products at rolling temperatures. (To be continued.) (S13e, 9-21)

325-S. Chlorine Method for the Determination of Non-Metallic Inclusions in Steel. C. W. Short, R. S. Roberts and G. Croall. *Iron and Steel Institute, Journal,* v. 186, May 1957, p. 85-89.

Describes new apparatus for chlorinating steel and two separate methods of analysis. 2 ref. (S11f, 1-3; ST, 9-19)

326-S. Hydrogen in Steelmaking Practice. Henry Epstein, John Chipman and Nicholas J. Grant. *Journal of Metals,* v. 9, *AIME Transactions,* v. 209, Apr. 1957, p. 597-608.

Determined hydrogen content for specimens from 3 acid openhearth, 2 basic openhearth and 7 basic electric furnace heats through refining period at tap and during pouring. Description of sampling technique and analytical apparatus. 21 ref. (S11r, D2, D5; ST, *H*)

327-S. Absolute Areas of Some Metallic Surfaces. Thomas L. O'Connor and Herbert H. Uhlig. *Journal of Physical Chemistry,* v. 61, Apr. 1957, p. 402-405.

Using the BET (gas adsorption) method, with ethane as adsorbate at −183°, roughness factors were calculated for various metal surfaces. (S15)

328-S. Immersed Ultrasonic Inspection of Pipe and Tubing. R. B. Oliver, R. W. McClung and J. K. White. *Nondestructive Testing,* v. 15, May-June 1957, p. 140-144.

Inspection of pipe and tubing used in nuclear reactors. Instrument used is adaptable to small tubing down to 3/16-in. O.D. as well as to 8 in. diameter pipe, and lends itself well to continuous inspection at high rates of travel. (S13g, 1-2)

329-S. Use of Multiple-Film Technics to Speed Industrial Radiographic Inspection. Ralph E. Turner. *Nondestructive Testing,* v. 15, May-June 1957, p. 146-150.

Single-exposure technique using two or more films of different radiographic speeds—the slower to record thin sections, the faster to record thick sections—provides shortcut to examination of certain multithickness specimens. Range of thickness recorded on film is limited by the various radiographic speeds of film used at exposure value selected. (S13e, 1-2)

330-S. Ultrasonic Transmission Tester. J. D. Ross and R. W. Leep. *Nondestructive Testing,* v. 15, May-June 1957, p. 152-154.

An ultrasonic pulse is transmitted through object under inspection and the received pulse is checked for abnormal attenuation. Abnormally attenuated impulses are counted as the object is scanned, the total count being a measure of area over which internal defect extends. Description of equipment. (S13g)

331-S. Ultrasonic Inspection in the Oil Refining and Related Industries. Dwight J. Evans. *Nondestructive Testing,* v. 15, May-June 1957, p. 156-160.

Various types of ultrasonic testing equipment for oil industry application described. In widespread application is the measurement of thickness of steel plates when there is access to only one side, such as sides of filled storage tank, O.D. of an operating pipeline, hull plates of a tanker. More recent applications include internal-flaw and fatigue-crack detection in drive shafts or engine parts, and testing of welded seams, either as primary inspection method or as a supplement to X-ray or radiography techniques. (S13g, S14g)

332-S. Use and Limitations of Flexible Fluorescent Intensifying Screens in Ship Radiography. K. G. Roberts. *Nondestructive Testing,* v. 15, May-June 1957, p. 162-165.

Fluorescent intensifying screens have been found useful for steel thicknesses up to approximately 2½ in. when using 260-kvp. portable X-ray equipment in the field with relatively short exposure times (4 min. at 30-in. SFD). This technique permits use of tube kilovoltage-thickness graphs, and radiographic sensitivity has been found to be slightly over 1.5% for steel thicknesses from 1½ to 2½ in. Sensitivity values can be improved to better than 1.5% by replacing front fluorescent screen with a 0.0005-in. lead screen, but upper limit of steel thickness is reduced to 2¼ in. For high quality radiography with cobalt-60, fluorescent intensifying screens offer no advantages. For best sensitivity in short exposure times, a no-screen film with lead intensifying screens has proved most satisfactory. 5 ref. (S13e, X8h; ST)

333-S. Testing and Examination of Electrodeposits. Pt. 2. Measurements

of Local and Average Thickness. R. Quarendon. *Product Finishing,* v. 10, Apr. 1957, p. 65-73.

Instruments and techniques used for measuring thickness of local and average electrodeposited coatings. Includes electromagnetic, reluctometer, nonmagnetic and radiation methods. 14 ref. (S14, 1-2, L17c)

334-S. **Some Reflections on the Use of Radioisotopes in Industrial Radiography, With Specific Emphasis on the Use of Iridium (192) for the Radiographic Inspection of Structural Welding in Shipbuilding.** Walter H. Sansom. *Shipbuilder and Marine Engine-Builder,* v. 64, May 1957, p. 329-333.

A discussion of radioactive isotopes available and the techniques of radiographic inspection. (S13e; 14-13)

335-S. **Industrial Radiography by Gamma-Ray Projection From Radioactive Isotopes.** Charles M. Dick. *Welding Journal,* v. 36, May 1957, p. 457-462.

Theory of flaw detection by radiography; characteristics of commonly used radioactive isotopes comparing energy levels and penetrating power; types of projectors and shields for control of radiation pattern of radioactive source; portability and other advantages of radioisotopes for inspection of welds. (S13e; 14-13)

336-S. **Determination of Rare Earths in Thorium.** E. J. Center, W. M. Henry and R. D. Householder. *U.S. Atomic Energy Commission,* BMI-260, May 15, 1957, 13 p. (CMA)

A quantitative method for separating and determining individual lanthanons in thorium down to 0.05 ppm. A cellulose column is used in the chromatographic separation, and a solution-type spectrographic procedure follows. Values given for recovery of europium, cerium, praseodymium, samarium and thulium tracers. (S11; Th, EG-g)

337-S. **Chemical Analysis of Zirconium and Zircaloy Metals.** E. B. Read and H. M. Read. *U.S. Atomic Energy Commission,* NMI-1171, Jan. 31, 1957, 108 p. (CMA)

Procedures for chemical analysis of other elements in zirconium and Zircaloy alloys, including aluminum, cadmium, chromium, copper, iron, lead, magnesium, manganese, molybdenum, nickel, tin, titanium, tungsten, vanadium, zinc, boron, carbon, chlorine, phosphorus, silicon, nitrogen, oxygen, hydrogen and the lanthanons. 78 ref. (S11; Zr)

338-S. **Improved Technique for Determining the Softening Temperatures of Ores and Sinters.** A. G. Astakhov. *Zavodskaya Laboratoriya,* v. 22, no. 5, 1956, p. 571-572. Henry Brutcher Translation, no. 3903.

Drawbacks of penetrating-rod methods currently in use; application of an electrical (bridge) system. (S16s; RM-n)

339-S. (English.) **Mass Spectrometric Study of Gallium and Indium.** Jean Drowart and Richard E. Honig. *Societes Chimiques Belges, Bulletin,* v. 66, May-June 1957, p. 411-412.

Gallium and indium were evaporated from beryllium oxide and graphite crucibles into the ion source of a modified 60° mass spectrometer at sample temperatures ranging from 1035 to 1320° K. for gallium, and from 800 to 1130° K. for indium. Small Ga_2^+ and Ga_2O^+, and In_2^+ and In_2O^+ peaks were observed. During the course of the evaporations, the peak ratios Ga_2^+/Ga_2O^+ and In_2^+/In_2O^+ stayed essentially constant, but the absolute peak intensities decreased to very small values. (S11c; Ga, In)

340-S. (French.) **Application of Radioactive Elements to Research on the Refining of High-Purity Aluminum and Iron.** Philippe Albert. *Annales de Chimie,* v. 1, Nov-Dec. 1956, p. 827-896.

Principles of systematic analysis of a group of elementary particles following irradiation. Analysis of iron and aluminum after atomic pile radiation; study of recrystallization of aluminum after cold working; study of elimination of and proportion of last traces of carbon in pure iron. 26 ref. (S11q, N5, 2-17; Al-a, Fe-a)

341-S. (German.) **Use of Radioactive Isotopes in the Metal Industry.** Kurt Sauerwein. *Atom Wirtschaft,* No. 1, Jan. 1956, p. 13-15.

Irradiation and tracer methods for thickness measurements and finished product control, testing of materials, radioactive level measurement, marking of substances, measurement of wear and mixing processes. (S14e, S18, Q9, 1-4; 14-13)

342-S. (German.) **Flue Gas Condensation Point and Corrosion.** W. Gumz. *BWK. Brennstoff, Wärme, Kraft,* v. 9, Mar. 1957, p. 118-125.

Formation of flue gas depends on the type of firing, temperature, excess of air and presence of suspended substances (dust, aeorosol). Measurement of the conductivity of the condensation layer or the cloudiness of a mirror were used to obtain flue gas condensation points. Suppression of sulphur trioxide formation and lowering of condensation level may be obtained through sudden cooling of gases, addition of absorbing solid materials or chemical absorption of the sulphuric acid. 50 ref. (S18, R7k; RM-g)

343-S. (German.) **Aluminum Casting Alloys. Tentative Standards to DIN 1725.** Ernst Brunhuber. *Giesserei-Praxis,* v. 75, May 10, 1957, p. 202-204.

Tabulation and discussion of German standards for nonferrous metals with changes to be incorporated. (S22, 15-6; Al, 5)

344-S. (Japanese.) **Colorimetric Determination of Tin in Nonferrous Metals by the Use of Oxidized Hematoxylin. Pt. I. Colorimetric Determination of Tin in Metallic Zinc. Pt. II. Colorimetric Determination of Tin in Metallic Lead.** Masuo Kojima. *Japan Analyst,* v. 6, no. 3, 1957, p. 139-146.

Various conditions for determination and the effect of interfering ions have been investigated. As a method of concentration of tin by the manganese dioxide method, the coefficient of coprecipitation of tin was determined with the use of radioactive isotope Sn^{113}; and this was applied to the quantitative analysis of tin in metallic zinc. The concentration of tin in metallic lead can be made similarly by the manganese dioxide coprecipitation method. (S11a; *Sn*)

345-S. (Japanese.) **Microdetermination of Carbon in Nonmetallic Compounds of Iron and Steel.** Hitoshi Kamada, Shozo Toda and Takao Nishiya. *Japan Analyst,* v. 6, no. 3, 1957, p. 146-150.

An attempt was made to collect carbon dioxide produced from combustion by cooling with liquid oxygen, a part of which is taken in a gas meter and its quantitative determination carried out by mass analysis, using argon as an internal standard. Errors were 2-3% in samples containing 0.1 mg carbon. (S11r; Fe, ST, *C*)

346-S. (Japanese.) **Photometric Determination of Nitrogen in Steel.** Hitoshi Kamada and Ken Sato. *Japan Analyst,* v. 6, no. 3, 1957, p. 150-154.

An attempt to use pyridine-pyrazolone reagent as a coloring agent for cyanide for the investigation of a new quantitative colorimetric method, and the data collected are compared with those obtained by a micro-Kjeldahl method of steam distillation. (S11a; ST, *N*)

347-S. (Japanese.) **Analytical Studies on Microgram Quantities of Antimony. Pt. I. Decomposition and Concentration of Antimony in Lead.** Niro Matsuura and Masuo Kojima. *Japan Analyst,* v. 6, no. 3, 1957, p. 155-160.

Colorimetric determination of antimony in lead of high purity of so-called "five-nine" grade by the use of Sb^{124} was investigated. 18 ref. (S11a; Pb, *Sb*)

348-S. (Japanese.) **Analytical Studies on Microgram Quantities of Antimony. Pt. II. Ion Exchange Separation of Antimony in Highly Pure Lead Metals.** Yukichi Yoshino and Masuo Kojima. *Japan Analyst,* v. 6, no. 3, 1957, p. 160-164.

Radiochemical studies using Sb^{124} as a tracer proved that the antimony species obtained by dissolving the sample in dilute nitric acid can be converted into adsorbable form by heating with strong hydrochloric acid. It was also demonstrated that Sn (IV) can be separated by elution with 1N HNO_3 prior to that of Sb (V) with 1N NaOH. Methods of anion exchange separation of antimony in pure lead by both column and bath operation are proposed and some preliminary data are presented. 7 ref. (S11f; Pb, *Sb*)

349-S. (Russian.) **Spectrophotometric Determination of Tantalum in Titanium Alloys in the Ultraviolet.** B. M. Dobkina and E. I. Petrova. *Zavodskaya Laboratoriya,* v. 23, 1957, p. 421-422. (CMA)

The presence of titanium interferes with the determination of tantalum as a pyrogallol complex. The effect of the presence of titanium can be considerably reduced by using hydrochloric acid as the reaction medium and by observing in the ultraviolet part of the spectrum. These results were confirmed and it was established that reproducible results are obtained only when the reagents are introduced in a definite order. 8 ref. (S11a; Ti, *Ta*)

350-S. (Book.) **Compilation of Steel Piping Materials.** 455 p. June 1957.

American Society for Testing Materials, 1916 Race St., Philadelphia 3, Pa. $4.50.

Contains 60 specifications, one method of test and one classification. Of these, 27 are new or substantially revised since the previous edition of September 1955. Among topics covered are pipes; boiler, superheater, and miscellaneous tubes; steel tubes; heat exchanger and condenser tubes. Included are specifications for the following materials used in pipe and related installations; castings, forgings, bolts and nuts. (S22; ST, 4-10, 15-18)

351-S. Tantalum Determination in Presence of Niobium by Precipitation With N1 - Benzoyl - N - Phenylhdroxylamine. Ross W. Moshier and James E. Schwarberg. *Analytical Chemistry,* v. 29, June 1957, p. 947-951.

Procedure is given. The error in the determination is 0.2 mg. of tantalum oxide. Titanium and zirconium show negligible interference compared to columbium. 22 ref. (S11; Cb)

352-S. Volumetric Determination of Uranium. Titanous Sulfate as Reductant Before Oxidimetric Titration. James S. Wahlberg, Dwight L. Skinner and Lewis F. Rader. *Analytical Chemistry,* v. 29, June 1957, p. 954-957.

A rapid method for routine determination of uranium in uranium-rich materials. 12 ref. (S11j; U)

353-S. Determination of Aluminum in Aluminum-Iron Alloys. John V. Gilfrich. *Analytical Chemistry,* v. 29, June 1957, p. 978-980.

The present method is based on the adsorption of interfering elements by an ion exchange resin; the nonadsorbable aluminum is determined gravimetrically by precipitation with ammonium hydroxide. 11 ref. (S11g; Al, Fe)

354-S. Isotopic Method for Determining Oxygen in Chromium. A. D. Kirshenbaum. *Analytical Chemistry,* v. 29, June 1957, p. 980-981.

Isotopic method for determining oxygen in titanium, zirconium, copper and iron has been extended to the determination of oxygen in chromium with an accuracy of 99% or better. 7 ref. (S11r; Cr, *O*)

355-S. Ultrasonic Testing of Heavy Steel Products. I. M. Mackenzie and R. Kennedy. *Engineering,* v. 183, May 24, 1957, p. 652-655.

Some of the problems which are facing the steelmaker in his attempts to apply ultrasonic tests to heavy steel products. Distinguishes between harmful defects and unimportant imperfections and indicates testing methods and equipment. (S13g; ST)

356-S. Tests Titanium for Hydrogen Content. *Iron Age,* v. 180, July 18, 1957, p. 146-147. (CMA)

Glenn L. Martin Co. (Baltimore) tests Ti-8Mn sheet samples for hydrogen with a vacuum fusion gas analysis apparatus developed by National Research Corp. to meet the Air Force specification of 150 ppm; the maximum for bar and forgings is 125 ppm. An induction heating furnace to drive off the gases from the sample is part of the apparatus. A McLeod gage reads gas volume and pressure. (S11r, 1-3; Ti, *H*)

357-S. Criteria for Evaluating Electrical Resistance Alloys. C. Dean Starr. *Metal Progress,* v. 72, July 1957, p. 88-94.

Even though the "life" of Ni-Cr and Ni-Cr-Fe resistors, as measured by standard test, has been increased tenfold in the past 30 years, the industry is still improving the older standardized analyses, and seeking new varieties of Ni-Cr-Al, Fe-Cr-Al and molybdenum-base alloys for more severe services. (S21, Q general, 2-12; SGA-q)

358-S. Tool Steels. Pt. II. Why Do Tool Steels Fail? L. F. Spencer. *Steel Processing,* v. 43, June 1957, p. 315-323, 346.

Poor-quality steel, bad designs, incorrect heat treatment, improper grinding and finishing techniques and application contribute to tool failure. (S21; TS)

359-S. Determination of Tin in Zircaloy and Uranium-Zircaloy: Colorimetric Procedure. J. L. Marley and O. J. Articolo. *U. S. Atomic Energy Commission*, KAPL-M-JLM-2. Feb. 14, 1957. 5p. (CMA)

Procedures for the separation and determination of tin in Zircaloy and uranium-Zircaloy. Tin is separated from simple Zircaloy by ion-exchange with Dowex-2-X in HCl. The tin is then eluted with H_2SO_4 solution and determined spectrophotometrically with dithiol. Tin is extracted from zirconium-uranium mixtures by means of diethylammonium-dithiocarbamate and then colori-

metrically determined with dithiol. (S11, Zr, U, *Sn*)

360-S. (English.) **Determination of Microamounts of Calcium, Magnesium and Aluminium in Titanium Metal.** H. Goto and S. Takeyama. *Tohoku University Research Institutes, Science Reports, Series A,* v. 9, Apr. 1957, p. 138-146. (CMA)

The difficult separation of calcium, magnesium and aluminum from titanium metal for their determination in micro amounts was accomplished by ether extraction of titanous thiocyanate from the sample; the aqueous phase is 2N in HCl. Using H_2SO_4 gives poor results. The calcium, magnesium and aluminum in the aqueous phase were then determined by photometric procedures. (S11j, S11a; Ti, *Ca, Mg, Al*)

361-S. (English.) **Bismuthiol II as an Analytical Reagent. Pt. VII. Estimation and Separation of Silver From Precious Metals.** Anil Kumar Majumdar and Bhu Ratna Singh. *Zeitschrift für Analytische Chemie,* v. 155, Feb. 26, 1957, p. 166-168.

Bismuthiol II separates silver from osmium, iridium, ruthenium, rhodium and gold at a pH of 8 to 9 if thiosulphate is used to complex interfering ions; complexone III (disodium salt of ethylenediamine tetra acetic acid) keeps osmium, iridium, ruthenium and rhodium in solution at a pH of 5 to 9. 5 ref. (S11; Ag)

362-S. (English.) **Determination of Thorium in Magnesium Alloys That Contain Zirconium.** G. B. Larrabee and R. P. Graham. *Zeitschrift für Analytische Chemie,* v. 156, no. 4, 1957, p. 258-265. (CMA)

In an indirect polarographic method for thorium in magnesium alloys containing zirconium, the zirconium interference is removed by a prior removal with an anion exchange resin. The zirconium can be easily eluted for subsequent determination. (S11m; Mg, *Th*)

363-S. (Czech.) **Photocolorimetric Determination of Zirconium With Morin.** H. Tuma and N. Tietz. *Chemicke Listy,* v. 51, Apr. 1957, p. 722-725. (CMA)

Zirconium in iron alloys and carbides can be determined by using the yellow complexes zirconates form with morin in acid solutions. Iron, cobalt, nickel, chromium and aluminum (the latter up to certain concentrations) do not interfere with the coloring. 7 ref. (S11a; Zr)

364-S. (French.) **Magnetic Methods for the Detection of Impurities in Solids.** L. Weil. *Bulletin de l'Institut International du Froid* (International Institute of Refrigeration), Supplement, Annexe 1956-2, Sept. 1956, p. 77-82.

Importance of magnetic measurements at very low temperatures for determining impurities in solids. Paramagnetic susceptibility is higher (in the case of dissolved magnetic impurities) as the temperature is reduced; ferromagnetic fluctuations disappear. Nature of the impurities; determination of Curie points; dimension of precipitates; limits of sensitivity of magnetic methods. 6 ref. (S13h; 9-1)

365-S. (French.) **Application of Statistical Methods in the Foundry.** L. Dor. *Fonderie Belge,* no. 5, May 1957, p. 81-91.

The principles and methods underlying industrial quality control; experimental techniques; possible applications of statistical quality control in foundry operations. 6 ref. (S12, E general)

366-S. (German.) **A New Sampling Process of Liquid, Killed and Rimmed Steel for a Determination of Oxygen and Hydrogen Content.** Hermann Schenk, Karl Heinz Gerdom and Klaus-Günther Schmitz. *Archiv für das Eisenhüttenwesen,* v. 28, Mar. 1957, p. 123-125.

By the use of quartz pipettes which are evacuated to the extent of 1 x 10 $Torr^{-4}$ and sealed with light meltable soft iron caps, the total gas content of the liquid steel is obtained. In oxygen determination it is advantageous to obtain alumina-free rimmed samples. 14 ref. (S12h, S11r, 1-3; ST, *O, H*)

367-S. (German.) **Photo-Electric Spectrometer for Testing of Steel.** Hans Diebel and Wilhelm Hanle. *Archiv für das Eisenhüttenwesen,* v. 28, Mar. 1957, p. 127-132.

Construction of a grid spectrometer; advantages of the grid for photo-electric measurements; adjustment of optical components; plotting apparatus; excitation; spark discharge; spectral lines; examples of calibration curves for steels and aluminum alloys. 22 ref. (S11k, 1-3, ST, Al)

368-S. (German.) **Practical Experiences With the New Photo-Electric Grid Spectrometer.** Fritz Thorn. *Archiv für das Eisenhüttenwesen,* v. 28, Mar. 1957, p. 133-134.

Measurements on light metal alloys; sample preparation; accuracy of analysis. (S11k, 1-3; Al, Mg)

369-S. (German.) **Development Possibilities of Photo-Electric-Emission Spectroscopic Analysis.** Hans Krempl and Günther Scheibe. *Archiv für das Eisenhüttenwesen,* v. 28, Mar. 1957, p. 135-143.

Problems with regard to spectrochemical light source, chemical processes and decomposition of materials; intensity flow of line emission; new spark producer; automatic recording device; photo-electric spectro chart. 16 ref. (S11k, 1-3)

370-S. (German.) **Application of Nondestructive Inspection Methods in Production Control.** H. Kostzewske. *Metall,* v. 11, July 1957, p. 582-586.

Nondestructive checking methods lend themselves particularly to "in production" control linked with automatic feedback devices. Gaging instruments using beta and gamma rays as applied to rolling mills are described; the principles of ultrasonic crack and flaw detectors, eddy current and magneto-inductive-type checking instruments are given. 17 ref. (S13, S14, 1-2)

371-S. (German.) **Utilization of Isotopes and Radiation Sources in the Metallurgical Industry.** A. M. Samarin. *Neue Hütte,* v. 2, Feb-Mar. 1957, p. 69-76.

Investigations on chemical reactions, blast furnace operation, casting, diffusion and metallurgical processes. 12 ref. (S general; 14-13)

372-S. (German.) **Ultrasonic Testing of Heavy Forgings.** Günter Beckmann. *Neue Hütte,* v. 2, Feb-Mar. 1957, p. 169-178.

Inspection of heavy forgings; ultrasonic and echo methods; effect of structural conditions and forging process on ultrasonic testing; determination of usability of forgings with flaws; effect of separation, metallic inclusions and micro-flaws. 9 ref. (S13g; 4-1)

373-S. (German.) **Determination of the Hafnium Content in Zirconium by Activation Analysis.** T. Stribel. *Zeitschrift für Angewandt Physik,* v. 9, June 1957, p. 293. (CMA)

A procedure for the determination of hafnium in zirconium by neutron activation, using the gamma-radiation of the 19-sec. isomer Hf^{179} produced by neutron capture in Hf^{178}. Hafnium contamination as low as 10^{-4} parts by weight can be determined with an error of $\pm 5\%$. The present limit of the method lies below 10^{-5} parts by weight, but the sensitivity could be increased still further. 2 ref. (S11q; Zr, *Hf*)

374-S. (Japanese.) **Spectrophotometric Determination of Vanadium in Steel and Iron.** S. Wakamatsu. *Japan Analyst,* v. 6, May 1957, p. 273-277. (CMA)

A spectrophotometric method for vanadium based on the yellow color developed in concentrated H_2SO_4 is described. The iron or steel sample is decomposed with $HClO_4$, the color is developed and the quantity of vanadium present is read at 390 $m\mu$. (S11a; AY, CI, *V*)

375-S. (Japanese.) **Rapid Determination of Fe in Pure Al Foil and Al-Fe Alloy by Decomposition With Sulphuric Acid. Pt. 2. Studies on the Interference of Other Coexisting Elements.** Toyoji Ushioda, Osamu Yoshimura and Shigeo Inoue. *Light Metals,* v. 7, May 1957, p. 70-75.

Study of the interference of Ti, V, Cu, Cr and Sn. 9 ref. (S11j; Al, *Fe,* 4-6)

376-S. (Japanese.) **Determination of Trace Sodium and Nitrogen in Aluminum.** Yukio Kitano, Kazuichi Akiyama, Kichio Akiyama and Tsuyoshi Ozaki. *Light Metals,* v. 7, May 1957, p. 76-81.

Determination of sodium in aluminum by flame photometry, linear extrapolation and heat extraction; determination of nitrogen in aluminum by photometric method using Nessler's reagent. Experimental procedures and results are summarized. 12 ref. (S11a; Al; *Na, N*)

377-S. Dye Penetrant Inspection. William D. Briggs. *American Machinist,* v. 101, May 6, 1957, p. 157-159.

Steps in using dye penetrant inspection for metal parts include cleaning, applying penetrant, removing excess dye, drying parts, spraying developer and interpreting results. (S13k)

378-S. Quality Control in the Manufacture of Film Coated Magnet Wire. W. E. Bramer. *American Society for Quality Control, National Convention Transactions,* May 1957, p. 89-97.

Control techniques currently employed at John A. Roebling's Sons Corp. plant in the manufacture of high-quality magnetic wire. (S12, F28; SGA-n)

379-S. The Flame Photometric Determination of Caesium in Bismuth and Bismuth-Uranium Alloy. P. C. Wildy. *Atomic Energy Research Establishment,* C/R 2114, 1956, 11 p.

Method for determination of cesium in bismuth and bismuth-uranium alloy using an image converter flame photometer. The precision (2σ) over the range 1 to 5% cesium is better than 5% and over the range 0.20 to 1% cesium is approximately 10%. The limit of sensitivity is 0.02%. (S11a; Bi, *Cs*)

380-S. Spectrographic Determination of Mo, Be, Fe, Cr and Ni in Bismuth and Bismuth-Uranium Alloys. M. J. Owers and M. S. W. Webb. *Atomic Energy Research Establishment,* C/R 2115, 1957, 15 p.

Bismuth metal or alloys are converted to oxide, cobalt and vanadium incorporated as internal standards and 70 mgm. charges burnt to completion in cupped graphite electrodes. The resulting spectra are evaluated for Mo, Be, Fe, Cr and Ni over the range 1 to 200 ppm. by microphotometry, and, with the exception of iron, sensitivities of 1 ppm. or better are attained. At the 50-ppm. level, coefficients of variation on single spectra vary from 12% in the case of chromium down to 6% for molybdenum and nickel. 7 ref. (S11c; Bi, *U*)

381-S. Modern Trends in Metallurgical Analysis. W. T. Elwell. *Iron and Steel,* v. 30, July 1957, p. 347-353.

Spectroscopy, spectrophotometry, radioactivation, homogeneous precipitation, analysis of solid samples, analysis of titanium and its alloys. 23 ref. (S11; Ti)

382-S. Analysis of a Silver-Copper Alloy. Ogden Baine and John Banewicz. *Journal of Chemical Education,* v. 34, June 1957, p. 297-298.

Experimental procedures and equipment used in the quantitative analysis of various silver bronzing alloys with a wide range of silver and copper content. 6 ref. (S11; Ag, Cu)

383-S. Production of Ball and Roller Bearings. *Machinery,* v. 90, June 7, 1957, p. 1256-1268.

Maintenance of dimensional control by use of electronic comparators, visual inspection system and grading after final finishing of balls and rollers. (S14, T7d)

384-S. Performance of Carbide Cutting Tools. *Machinery,* v. 91, July 19, 1957, p. 138-143.

Influence of speed, feed and depth of cut; tool life results; utilization of improved tool life; influence of cutting fluid. (S21, T6n; 6-19)

385-S. Some Recent Advances in the Analysis of Cast Iron and Foundry Materials. W. E. Clarke. *Metallurgia,* v. 56, July 1957, p. 47-52.

Revisions and improvements in methods of analysis by the Methods of Analysis Sub-Committee of the British Cast Iron Research Association. 19 ref. (S11; CI)

386-S. Microchemical Analysis. G. W. C. Milner and J. W. Edwards. *Metallurgical Reviews,* v. 2, no. 6, 1957, p. 109-155.

Extensive literature review contains a description of methods commonly used for analysis of metals from milligram samples; described are microvolumetric, microgravimetric, absorptiometry, polarography, electro-analysis, electrometri-titration, chromatographic and microanalysis of gases; reviews application of these methods to analysis of the following elements found in iron and steel; carbon, sulphur, phosphorus, molybdenum, nickel, chromium, manganese, silicon, cobalt, tungsten, vanadium, titanium, copper, lead, tin, aluminum, zirconium and oxygen. Procedures for determining alloying constituents in aluminum, copper, tin, lead, zinc, nickel, and magnesium-base alloys also reviewed. 205 ref. (S11d)

387-S. X-Rays Speed Chemical Analysis. R. D. Ahles. *Modern Castings,* v. 32, July 1957, p. 45-46.

X-ray emission spectrometry offers accurate and speedy analysis for stainless steels, high-temperature alloys and other foundry alloys. (S11p; SS, SGA-h)

388-S. Characteristics of Sparks Generated by the Grinding of Metals. *Welding Engineer,* v. 42, Mid-June 1957, p. 96.

Nature and quantity of sparks produced on grinding iron and alloy steel. (S10n; AY, CI)

389-S. Spectrographic Determination of Phosphorus in Steel. H. Krempl and H. Bertam. *Archiv Eisenhüttenwesen,* v. 27, 1956, p. 303-309. *(Henry Brutcher Translation* no. 3761).

Limits of detectability of phosphorus in steel; sensitization of plates; choice of most suitable excitation; advantages of Seitner spark over Pfeilsticker interrupted arc and Feussner spark; density of P lines in four regions of spectrum as function of P concentration; recommended P line; effect of electrode shape on spectrum; volatilization of electrode; procedure for quantitative determination of phosphorus (limits of error: ±3%). (S11c; ST, *P*)

390-S. New Methods of Quality Control With Special Reference to Their Automation. Pt. 1. Electromagnetic Methods of Nondestructive Testing. F. Förster, K. Sprungmann, A. Michalski and W. Koch. *Technische Mitteilungen,* v. 50, 1957, p. 162-174. (*Henry Brutcher Translation* no. 3956).

Fundamentals of eddy-current detection of cracks in steel parts; eddy-current testing of semifinished steel; testing with magnetic leakage flux methods; crack detection by magnetography; development and automation of nondestructive testing with Magna-test-Q (Q=quality) suitable for sorting by composition, tensile strength, hardness, case depth, decarburization.
(S13h, S10, 18-24; ST)

391-S. Fractional Determination of Hydrogen in Steel. B. A. Shmelev. *Zavodskaya Laboratoriya,* v. 23, 1957, p. 263-269. (*Henry Brutcher Translation* no. 3963).

Liberation of hydrogen in various "fractions" by progressive increase in temperature of vacuum heating; various forms of apparatus for determinations by vacuum heating as opposed to vacuum fusion.
(S11r, 1-23; ST, *H*)

392-S. Determination of Finely Divided Vanadium, Molybdenum and Titanium Carbides. N. M. Popova, et al. *Zavodskaya Laboratoriya,* v. 23, 1957, p. 269-272. (*Henry Brutcher Translation* no. 3959).

Two methods of determining the finely divided fraction of V, Mo and Ti carbides in the residue left by anodic solution of drillings from steels alloyed with V, Mo or Ti. Effect of concentration of acid and time of boiling in HCL on solubility of carbides. Correlation between maximum content of fine carbides and the maximum secondary hardness on tempering of these steels. (S11j; ST, *V, Mo, Ti*)

393-S. Accelerated Method of Determining Small Amounts of Aluminum in Steel and Cast Iron. N. A. Agrinskaya. *Zavodskaya Laboratoriya,* v. 23, 1957, p. 279-280. (*Henry Brutcher Translation* no. 3960).

Colorimetric determination of aluminum in steel and cast iron with stilbazo, without prior separation of iron. Precautions to be taken with chromium-containing steels.
(S11a; ST, CI, *Al*)

394-S. (Czech.) **Photometric Determination of Titanium in Steels With the Aid of Chromotropic, Gallic and Pyrogallocarbonic Acid.** Lumir Sommer. *Chemicke Listy,* v. 51, May 1957, p. 875-879. (CMA)

The titanium content in steels even in low proportions can be determined with chromotropic acid, which forms a colored complex with titanium. The required pH value of the solution is 3.1-3.4, the wave length at which measurements are made is 470 mμ; the error does not exceed 2%. Satisfactory results can also be obtained with gallic and pyrogallocarbonic acids at pH 3.5-3.6. 18 ref. (S11a; ST, *Ti*)

395-S. (German.) **Characterization of Supersonic Readings on Steel Products.** Alfred Michalski and Hans Krächter. *Archiv für das Eisenhüttenwesen,* v. 28, Apr. 1957, p. 213-222.

Importance of factors determining the echo height; recommendations for classification of supersonic readings on tools; examples of evaluation of fluorescent screen images obtained from forgings and sheet metal; supersonic testing in a steel mill. 5 ref. (S13g; ST)

396-S. (German.) **Grinding Spark Test.** E. Drechsel. *Fertigungstechnik,* v. 7, Apr. 1957, p. 171-174.

Mechanism of the test, limitations, illustrations of many types of steels tested. (S10n; ST)

397-S. (Italian.) **Calibration of Radiographic Inspection Equipment.** Giorgio Moravia. *Rivista Italiana della Saldatura,* v. 9, Jan-Feb. 1957, p. 3-8.

Possibilities of objective evaluation of efficiency of this type of equipment. Results of a first series of experiments performed with photographic method on steel specimens of varying thicknesses. (S23, X8)

398-S. (Japanese.) **Colorimetric Analysis of Nickel in Ferro-Alloys.** To Imai and Nobumitri Nanun. *Chemical Society of Japan, Journal,* v. 60, May 1957, p. 544-546.

Volumetric determination of nickel in ferromanganese, ferrosilicon, silicomanganese and ferromolybdenum; degree of light absorption versus wave length for nickel, iron, chromium, molybdenum and manganese; in particular, the change in light absorption caused by the addition of nickel. (S11a; Fe, AD-n, *Ni)*

399-S. (Japanese.) **Spectrochemical Analysis by Waseda Univesity Apparatus. Pt. 4. Determination of Various Elements in Copper Alloys.** Kazuo Yasuda and Kiichiro Amano. *Japan Analyst,* v. 6, May 1957, p. 290-295.

Unit developed by the Casting Research Laboratory of Waseda University, Japan, for spectrochemical analysis; quantitative determination of aluminum, iron, nickel, and manganese in aluminum bronze. 3 ref. (S11k, 1-3; Cu)

400-S. (Japanese.) **Studies on Analytical Methods for Trace, Elements in Metals Using Radioactive Isotopes. Pt. 1. Determination of Zirconium in Steel.** H. Amano. *Japan Institute of Metals, Journal,* v. 21, Apr. 1957, p. 260-263. (CMA)

Tracer methods were used in evaluating various ways of determining zirconium in steel. The phosphate method was superior to the arsenate, basic selenite and mandelate methods. The separation of iron is by mercury cathode electrolysis rather than ion exchange. (S11q; ST, *Zr*)

401-S. (Japanese.) **Methods for Determination of the Degree of Calcination of Alumina.** Ichiro Adachi and Tokiji Takahashi. *Light Metals,* v. 7, May 1957, p. 37-42.

Two methods are proposed; one obtains the degree of calcination from "hydrating-degree", which is indicated by the amount of water required for hydration, being measured by titrating free alkali with a normal solution of hydrochloric acid; the second uses the relative degree of calcination, calculated from the height-ratio d=1.395 A° and d=1.375 A° peaks in the intensity distribution curves obtained by X-ray geiger counter. 3 ref. (S18, B15; Al, RM-n)

402-S. (Japanese. **Research on Sintered Carbide Face Milling Cutters. Pt. 1.** Makoto Okoshi and Noboru Shinozaki. *Scientific Research Institute, Reports,* v. 33, no. 3, May 1957, p. 137-154.

Cutters for super-hard alloys are usually brittle; to overcome the brittleness the shape of cutter should be properly designed; determination or durabiilty of tools; analysis of cutting methods. (S21, T6n; 6-19)

403-S. (Rumanian.) **Gravimetric Determination of Cerium and Thorium in Minerals.** Sanda Lupan. *Revista de Chimie,* v. 7, Nov. 1956, p. 661-665. (CMA)

The most suitable method for the separation of cerium and thorium from other elements is carried out by precipitation with oxalates at a given pH. Thorium is then separated from cerium by precipitating thorium in the form of its iodate in strongly acidic solution. (S11b; Ce, Th, RM-n)

404-S. (Rumanian.) **Use of Ion Exchangers in the Metallurgy and Analytical Chemistry of Rare Metals. I.** Il Galateanu. *Revista de Chimie,* v. 8, Jan. 1957, p. 15-19. (CMA)

The optimum conditions for the recovery of molybdenum from residues containing about 0.2-0.8 g. per l. Mo by means of a domestic ion exchange resin called anionit are investigated. The mechanism for the ion exchange reaction of molybdenum is indicated. 15 ref. (S11g; Mo)

405-S. (Russian.) **Determination of Oxygen, Hydrogen and Nitrogen in Molybdenum, Tungsten and Columbium.** G. V. Mikhailova, Z. M. Turovtseva and R. Sh. Khalitov. *Zhurnal Analiticheskoi Khimii,* v. 12, May-June 1957, p. 338-341. (CMA)

Hydrogen, oxygen and nitrogen in metallic molybdenum, tungsten and niobium, whether in dissolved state or chemically bound, can be determined by dissolving the metals in an iron bath containing carbon, whereby the fusion temperatures are lowered and oxides are reduced by carbon. At 1650° C. under vacuum all the gases are removed from the bath. 3 ref. (S11r; Mo, W, Cb; *O, H, N*)

406-S. (Russian.) **Determination of Columbium in the Presence of Large Amounts of Titanium.** A. I. Ponomarev and A. Ya. Sheskol'skaya. *Zhurnal Analiticheskoi Khimii,* v. 12, May-June 1957, p. 355-358. (CMA)

Ascorbic acid, $C_6H_8O_6$, forms soluble complexes with titanium which remain stable when columbium is precipitated with tannin in a hydrochloric acid solution. This re-

lationship was utilized for an accurate determination of columbium in the presence of large amounts of titanium, a situation that frequently occurs in ores and slags of titanium. 6 ref. (S11j; Ti, *Cb*, RM-n)

407-S. (Pamphlet.) **Steel Products Manual, Section 26, Revised. Stainless and Heat Resisting Steels.** 90 p. 1957. American Iron and Steel Institute, 150 E. 42nd St., New York 17, N. Y.

Manufacturing practices and product classification; chemical ranges and limits, sampling and analytical procedures; quality descriptions and restrictive requirements; properties and thermal treatment; blooms, billets and slabs; structural shapes; hot finished and cold finished bars; plates; hot rolled and cold rolled sheets; cold rolled strip; wire; mechanical properties, composition and details of working of each type. (S22; SS, SGA-h, 15-20)

408-S. Use of Elution Chromatography From Cellulose Columns for the Systematic Analysis of Special Steels. G. Venturello and A. M. Ghe. *Analyst,* v. 82, May 1957, p. 343-352.

Systematic determination and separation of molybdenum, cobalt, manganese, vanadium, nickel and chromium in steel which involves microchemical colorimetric determination of elements which are fractionally separated by elution from cellulose columns. 12 ref. S11a; AY)

409-S. Absorptiometric Determination of Vanadium in Steel. P. H. Scholes. *Analyst,* v. 82, no. 976, July 1957, p. 525-528. (CMA)

Tungstophosphoric acid and 3:3′-dimethylnaphthidine were each studied as colorimetric reagents for determining vanadium in steel. At a concentration range of 0.-1.5 mg. vanadium per 50 ml., a tungstovanadophosphate compound is formed when sodium tungstate and phosphoric acid are added. Iron and chromium interference may be compensated for if tungsten is absent. (S11a; AY, *V*)

410-S. Determination of Molybdenum in Titanium Alloys by Precipitation From Homogeneous Solution Using Thioacetamide. W. N. McNerney and W. F. Wagner. *Analytical Chemistry,* v. 29, Aug. 1957, p. 1177-1178. (CMA)

Determining the molybdenum in titanium alloys by the thioacetamide precipitation of molybdenum disulphide obviates the use of hydrogen sulphide streams for this purpose. The dense precipitate is easily filtered. Atmospheric pressure is adequate if the thioacetamide is in five to tenfold excess. 5 ref. (S11b; Ti, *Mo*)

411-S. Estimation of Titanium in Beach Sands. J. A. Corbett and D. H. Parkhurst. *Australasian Institute of Mining and Metallurgy, Proceedings,* no. 182, pt. 1, June 1957, p. 55-65. (CMA)

A colorimetric method. Other elements likely to be found in such deposits (e.g., iron, chromium, manganese, vanadium and columbium) do not interfere. Accuracy is within 0.3% for concentrates containing more than 95% TiO_2, and within 1% for tailings with 0.2% TiO_2. The method described uses a Hilger "Spekker" absorptiometer. 11 ref. (S11a; Ti, 14-9)

412-S. Determination of Aluminium in Cast Iron and Ferro-Silicon by the Fluoride Volumetric Method. W. E. Clarke and R. C. Rooney. *British Cast Iron and Research Association, Journal of Research and Development,* v. 6, June 1957, p. 666-669.

Volumetric technique for determining aluminum content. (S11j, CI, Fe, Si, AD-n, *Al*)

413-S. Time Savers in Brass Analysis. C. Goldberg. *Foundry,* v. 85, Aug. 1957, p. 102-104.

Chemical analysis, including determination of copper, nickel, iron, lead, phosphorus, tin, antimony, aluminum and sulphur. (S11; Cu-n)

414-S. Surface Examination by Radiation. A. E. Williams. *Industrial Finishing,* v. 9, July 1957, p. 685-690.

Possibilities of radioisotope thickness gages; use of electron diffraction camera for following surface roughness and metal structure; methods employing fluorescent or secondary X-radiation from base metal or fluorescent X-rays in plating metal itself for measurement of thin coatings; measurement of porosity in coatings with radioactive metals. (S15, S14e)

415-S. Radiography for Welding. Jay Bland. *Industry and Welding,* v. 30, Aug. 1957, p. 36-41, 63.

Radiation sources and factors determining selection; discussion of weld defects and interpretation of radiographic images. (S13e, 7-1)

416-S. Compositions of Unlisted Copper Alloys. *Machinery,* v. 63, Aug. 1957, p. 243-244.

Trade name, composition, applications and producer of wrought copper alloys not listed in Copper and Brass Research Association Manual of Standard Alloys. (To be continued.) (S22; Cu)

417-S. Determination of Micro Amounts of Calcium, Magnesium and Aluminium in Titanium Metal. Hidehiro Got and Shuro Takeyama. *Tohoku University. Research Institutes. Science Reports, Series A. Physics, Chemistry and Metallurgy,* v. 9, Apr. 1957, p. 138-146. (CMA)

Titanium removal by the extraction of titanous thiocyanate with ether. Procedures for the photometric determination of calcium, magnesium and aluminum after titanium extraction. 8 ref.
(S11a; Ti, *Ca, Mg, Al*)

418-S. Contributions to the Chemical Analysis of Copper in Zircaloy, Silicon in Uranium-Silicon Alloys, and Niobium in Uranium-Niobium Alloys. E. B. Read, P. R. Hicks, H. M. Lawler, E. Pollock, H. M. Read and L. Zopatti. Nuclear Metals, Inc., *U. S. Atomic Energy Commission,* NMI-1178, May 23, 1957, 17 p.

Procedure for the determination of copper in zircaloy by the application of neo-cuproine; the "peroxide" spectrophotometric method for the determination of columbium in uranium-columbium alloys.
(S11, Zr, *Cu,* U, *Si, Cb*)

419-S. Evolution of Economy in Testing Metals. Jack Fairlie. *Welding Engineer,* v. 42, Aug. 1957, p. 30-34.

Development of radiography in nondestructive testing of weldments and castings. Discussion of penetrant inspection, electrical resistance tests and ultrasonic process. (S13)

420-S. Behavior of Metal Heating Wires When Tested for Service Life. Pt. 2. Service Life as Function of Wire Gage. A. Schulze and D. Bender. *Metall,* v. 9, 1955, p. 878-882. (*Henry Brutcher Translation* no. 3742.)

Automatic temperature control arrangement combined with a counting mechanism for the number of switchings-in of the specimens being tested; study of both austenitic and ferritic alloy wires having diameters ranging from 0.008 to 0.12 in.; coils and V-shaped specimens of six different alloys. (S21; SGA-r)

421-S. Determination of Aluminum in Alloy Steels by the Cryolite Method. R. Leo and G. Köning. *Giessereitechnik,* v. 1, 1955, p. 26-28. (*Henry Brutcher Translation* no. 3788.)

Working procedures for the use of the cryolite method for determining aluminum in the presence of Cr, Ni, Mo, W, Ti, Cb and Zr; results obtained with up to 10% Al in the original steel or a composite solution from an alloy steel plus aluminum chloride. (S11; AY, *Al*)

422-S. Methods of Ultrasonic Testing of Welds. S. T. Nazarov and Yu. P. Panov. *Zavodskaya Laboratoriya,* v. 23, no. 3, 1957, p. 305-308. (*Henry Brutcher Translation* no. 3958.)

Methods of scanning welds for lack of fusion at edges and for internal defects, using inclined-face search units that introduce sound waves into the base metal well away from the actual weld site, with direct or reflected incidence of the sound on the weld. (S13g, K9r)

423-S. Measurement of Size of Internal Flaws in Metal by an Ultrasonic Technique. F. I. Ivanov and M. A. Akulin. *Zavodskaya Laboratoriya,* v. 23, no. 3, 1957, p. 309-311. (*Henry Brutcher Translation* no. 3968.)

Difficulties currently encountered in measuring the size of more or less deep-seated flaws with the ultrasonic flaw detector. Proposed technique of measuring a linear dimension of defects (even smaller in size than the search unit) with a relative error of 2 to 15%. (S13g)

424-S. Separation of Tantalum From Titanium. Yu. A. Chernikhov, R. S. Tramm and K. S. Pevzner. *Zavodskaya Laboratoriya,* v. 22, no. 6, 1956, p. 637-639. (*Henry Brutcher Translation* no. 3990.)

Previously abstracted from original. See item 458-S, 1956.
(S11, B14, Ta, Ti)

425-S. Determination of Small Quantities of Tin in Ores. I. A. Blyum and N. G. Zyryanova. *Zavodskaya Laboratoriya,* v. 22, no. 1, 1956, p. 46-47. (*Henry Brutcher Translation* no. 4003.)

Method for tin analysis in amounts of 0.005 to 0.10% in any ore, based on separation of tin from other elements by distillation as tetrabromide and susbsequent polarographic determination. (S11m; Sn, RM-n)

426-S. (French.) **Direct Determination of Metallic Zinc and Zinc Oxide**

in the Same Product. Corneille Ek. *Revue Universelle des Mines,* v. 13, July 1957, p. 249-253.

Current methods of determining metallic zinc in zinc dust. In a solution of $HgCl_2$ + KCN with pH 6 only the metallic zinc in the mixture Zn-ZnO dissolves. (S11; Zn)

427-S. (German.) **Permanganometric Determination of Vanadium in Ferrovanadium After Reduction by Sodium Nitrite.** L. Erdey and K. Vigh. *Acta Chimica,* v. 11, 1957, p. 73-83. (CMA)

The pentavalent vanadium is reduced by sodium nitrite to the tetravalent form and is titrated by potassium permanganate. The advantage of the method lies in the fact that trivalent iron is not reduced by the sodium nitrite, and so need not be removed before determination of the vanadium. The measurements can be carried out in about 1 hr. 20 ref. (S11j, V, Fe, AD-n)

428-S. (German.) **Separation and Determination of Vanadium, Molybdenum and Titanium by Capillary Chromatography.** P. Cerny. *Collection of Czechoslovak Chemical Communications,* v. 22, Apr. 1957, p. 614-616. (CMA)

Spot test using pyrocatechin is done in 3-10 min. and is very sensitive. Iron may be removed with rhodanide. (S11a; V, Mo, Ti)

429-S. (Italian.) **Spectrophotometric Determination of Boron in Aluminum Alloys With High Silicon Content Using 1,1'-Dianthrimide.** G. Matelli. *Alluminio,* v. 24, June 1957, p. 255-257.

Usefulness of method for the determination of boron in aluminum alloys containing 4-6% silicon. The quantity of boron which remains insoluble in acid is lower than the admissible analytical error. 5 ref. (S11k; Al, *B*)

430-S. (Japanese.) **Rapid Photometric Determination of Molybdenum in Ferromolybdenum by the Stannous Chloride Reduction Method.** Shuichiro Mitzoguchi. *Japan Analyst,* v. 6, June 1957, p. 376-381. (CMA)

Procedure. The relationship between light absorption and molybdenum content up to about 90 mg. is linear. 8 ref. (S11a, Mo, Fe, AD-n)

431-S. **Determination of Vanadium and Chromium in Alloys With Uranium.** H. H. Willard and O. H. Kriege. *U. S. Atomic Energy Commission,* LA-1957, Sept. 1955, 19 p. (CMA)

U-V and U-V-Cr alloys were analyzed for their constituents. The usual titrimetric ferrous sulphate method was studied for vanadium oxidized by ceric sulphate and by perchloric acid fusion. When chromium is present the latter is used, and then both vanadium and chromium are titrated with standard ferrous sulphate. (S11j; U, *V, Cr*)

432-S. **Determination of Small Amounts of Carbon in Metallic Titanium and Alloys by the Conductometric Method.** W. R. Sheehan. Watertown Arsenal Laboratory, Report 401/228, *U. S. Office of Technical Services,* PB 131119, Aug. 1954, 11 p. (CMA)

Titanium samples were analyzed for carbon content and homogeneity. The Leco CD10 conductometric carbon determinator was used. Results compared with those of other workers. (S11b; Ti, *C*)

433-S. **Spectrographic Solution Methods for the Analysis of Slags.** S. Bergenfelt. *Jernkontorets Annaler,* v. 140, no. 1, 1956, p. 75-80 and v. 141, no. 4, 1957, p. 231-232. (*Henry Brutcher Translation* no. 3879.)

Description and results for two procedures. (S11k; RM-q)

434-S. (Czech.) **Effect of the Nature of Electrolyte Selected for the Separation of Carbides of Steels.** N. Tietz, V. Toman and H. Tuma. *Hutnicke Listy,* v. 12, June 1957, p. 517-521. (CMA)

The following substances were tested for their suitability in electrolytic separation of carbides from steel samples, the stability of the product in the electrolyte serving as a criterion: hydrochloric acid, citric acid, sodium citrates, iron sulphate, complexone III and trilon B. After experimenting with carbides of iron, chromium, vanadium, molybdenum, tungsten, zirconium and tantalum, adequate electrolytes, temperatures and current intensities were determined for particular compositions of steels. 14 ref. (S11f; ST, 14-18)

435-S. (Czech.) **Analysis of Carbides Isolated From Steel.** M. Kroupa. *Hutnicke Listy,* v. 12, June 1957, p. 521-522. (CMA)

Chemical procedures for successive determinations of carbides in the anode mass remaining after the electrolytic treatment of steel samples. Metals identified in the carbide mass include tungsten, chromium, iron, vanadium, titanium and molybdenum.
(S11j; ST, *W, Cr, Fe, V, Ti, Mo,* 14-18)

436-S. (Czech.) **Spectrum-Analytical Determination of Low Contents of Ti-**

tanium in Steels. O. Belohlavek. *Hutnicke Listy,* v. 12, June 1957, p. 522-524. (CMA)

Titanium content in steels, ranging from 0.03 to 0.20%, can be determined from photographs of spark spectrum of steel samples serving as one of the electrodes, the other electrode being made of iron. The intensity of titanium lines 3349.035 Å and 3349.406 Å is compared with that of the line Fe 3399.34 Å. In the presence of considerable amounts of chromium in the steel it is recommended to use also the resultant of the line Fe 3347.927 Å covered by the line Cr 3347.837 Å. 8 ref. (S11k; ST, *Ti*)

437-S. (German.) **Supersonic Testing of Bonded Connections.** J. Bernert and S. Bönisch. *Fertigungstechnik,* v. 7, Feb. 1957, p. 81-82.

The reflecting method is used in testing bonded sheet metal 0.3 to 3.0 mm. thick. This method employs two crystals, one as transmitter and the other as receiver. Since the echo impulse method can only be used with material approximately 10 mm. thick, it is inapplicable here. (S13g; 7-8)

438-S. (German.) **Approximate Calculation for Determining Exposure Values for Gamma Radiography with Ir^{192} and Cs^{137}.** W. H. Papke. *Schweissen und Schneiden,* v. 9, July 1957, p. 349-353.

Influence of radioactivity, wall thickness and film emulsions on the exposure values; calculation of a correction factor; penetration of several walls and different materials; comparison of penetration performances. 4 ref. (S13e; Ir, Cs)

439-S. (Italian.) **Systematic Analysis of Titanium Alloys by Electron Chromatography in Cellulose Columns.** A. M. Gue and A. R. Fiorentini. *Annali di Chimica,* v. 47, July-Aug. 1957, p. 759-769. (CMA)

The determination of molybdenum, iron, manganese, aluminum and chromium in H_2SO_4-HNO_3 solutions of samples of titanium alloys is performed by successive elution in several columns of cellulose pulp, using acetylacetone as the principal element. Chromatographic fractions so obtained are examined colorimetrically. (S11a; Ti)

440-S. (Italian.) **Nondestructive Tests.** F. Baldi. *Fonderia Italiana,* v. Mar. 1957, p. 121-125.

Types of tests and their applications; criteria for selection of control methods; comments on evaluation of results. 8 ref. (S13)

441-S. (Italian.) **Focus-to-Film Distance in Radiographic Inspection of Welds.** Giorgio Moravia. *Rivista Italiana della Saldatura,* Mar-Apr. 1957, p. 54-63.

On basis of permissible maxima of penumbra effect and of different penetrations of specimen by central and peripheral rays of the beam, minimum focus-film distances are calculated for some typical cases of weld inspection. Special attention to examination of circumferential welds of cylindrical bodies. (S13e; 7-1)

442-S. (Japanese.) **Radiographic Study of Casting Design.** Hirokuni Shiromura. *Casting Institute of Japan, Journal,* v. 29, Apr. 1957, p. 229-230.

Casting defects which can be identified by gamma rays are internal hot-tears, shrinkage, gas-holes, inclusions and sand spots. Design may be improved by study of defects. (S13e, 9-18, 9-19, 17-1)

443-S. (Japanese.) **Segregation in Casting. Report 7.** Kazuo Yasuda. *Casting Institute of Japan, Journal,* v. 29, Apr. 1957, p. 223-234.

Segregation of aluminum-copper alloys studied by spectrographic analysis. The segregation curve shown from surface to center of the casting. (S11k; Al, Cu, 9-19)

444-S. (Japanese.) **Some Experiments on the Carbon Analysis of Cast Irons.** Tomoo Sato and Masami Kanno. *Casting Institute of Japan, Journal,* v. 29, June 1957, p. 447-451.

For obtaining the most reliable value in the carbon analysis of cast iron, all chips turned or drilled must be used for each analysis. The change of carbon content of spheroidal graphite cast iron after the addition of magnesium to the melt is discussed. 5 ref. (S11; CI, *C*)

445-S. (Japanese.) **Automation for the Iron and Steel Industry.** Masakazu Takahashi and Takeo Sakai. *Denki Zashi (OHM),* v. 32, no. 6, 1957, p. 34-51.

Automatic measurement for blast furnaces, Dwight Lloyd sintering machines, coke furnaces, converter soaking furnaces and reverberatory furnaces. 9 ref. (S16, S18, D general; Fe, ST)

446-S. (Japanese.) **Studies on Rapid Analysis of Hydrogen in Titanium and Its Alloys.** N. Oda and K. Norishima. *Electrochemical Society of Japan, Journal,* v. 25, May 1957, p. 269-273. (CMA)

Experiments performed to obtain the best analytical conditions for determining hydrogen in titanium and its alloys. The extraction percentage of hydrogen by steel combustion analysis was compared with the hydrogen percentage as obtained by the vacuum fusion method. The combustion method was practicable for industrial analysis. (S11r; Ti, *H*)

447-S. (Japanese.) **Method for the Continuous Measurement of Liquid Steel Temperature in the Ladle.** Riichi Katakura, Hiroshi Miwa and Yoshiro Wada. *Sumitomo Metals,* v. 9, Jan. 1957, p. 13-20.

An immersion thermocouple was employed and a fused alumina tube was used instead of a silica tube to protect the platinum thermocouple. The fused alumina tube was fixed on the ladle wall near the bottom, and covered with alumina cement and steel tube to prevent heat shock. Typical measurements on various size ladles are shown. The temperature difference of liquid steel between the value observed by this continuous immersion method at the bottom of the ladle and one observed by this quick immersion technique at other places is about ± 20° C. (S16, X9q; ST, 14-10)

448-S. (Japanese.) **Simultaneous Spectrographic Determination of Si, Mn, Cu, and Cr in Pig Iron.** Yoshifuru Niimi and Takashi Kitahara. *Sumitomo Metals,* v. 9, Jan. 1957, p. 31-42.

A condensed spark method was used with the Shimadzu medium quartz spectrograph (Cornu type). The electrodes for analysis are chill cast in the form of pencils, 8 mm. in diameter and 100 mm. in length. By checking various operating conditions such as the shape of electrodes, excitation, presparking, exposure, photography and selection of suitable line pairs, etc., some optimum conditions were found. In correlating daily chemical and daily spectrographic determination the coefficient of variation was found to be small. This procedure speeds up the analysis and increases the capacity as compared with chemical analysis. 9 ref. (S11k; CI-a, *Si, Mn, Cu, Cr*)

449-S. (Russian.) **Investigation of Defective Rails.** V. G. Mikheev, *Stal',* v. 17, Apr. 1957, p. 343-347.

The largest portion of the defects was associated with local contamination of metal by nonmetallic inclusions and the presence of fine cracks and fissures in the middle of the rail base. A significant portion of the rails removed proved to be sound. (S13, T23q; ST, 9-19)

450-S. (Russian.) **Method of Temperature Measurement of Machined Surfaces.** L. G. Kulikov. *Vestnik Mashinostroenia,* v. 37, Mar. 1957, p. 46-48.

Method for measuring the temperature of the surface layer 0.03-0.04 mm. thick. The duration of the peak temperature at the cutting speed of 300 meters per min. is 0.003-0.004 sec. Approximately the same time is required to heat up the surface. Cooling is much slower and lasts 0.01-0.02 sec. 3 ref. (S16, G17)

451-S. (Russian.) **Temperature of Surface Layers of Parts on Polishing.** Sh. M. Dubinski. *Vestnik Mashinostroenia,* v. 37, Mar. 1957, p. 48-50.

Method for determining temperature of the polished surfaces. The temperature reaches 900-1100° C. at the polishing speed of 18 meters per sec. and 750-850° C. at the speed of 9 m./per sec. It is very likely that even higher temperatures may be reached. 4 ref. (S11, L10b)

452-S. (Russian.) **Determination of Molybdenum in Titanium-Molybdenum Alloys With the Aid of Ion-Exchange Chromatography.** I. P. Kharlamov and P. Ya. Yakovlev. *Zavodskaya Laboratoriya,* v. 23, no. 5, 1957, p. 535-536. (CMA)

It is proposed to use either sulphocarbon or aluminum oxide for chromatographic separation. The use of sulphocarbon is based on its ability to absorb MoO_2^{+2} in preference to TiO_2^{+2}, VO^{+2}, Cr^{+3}, Mn^{+2}, Fe^{+3}, Co^{+2} and Ni^{+2}. The use of aluminum oxide is based on the tendency of elements of the iron subgroup to form stable complexes with phosphoric, tartaric or citric acid which are readily absorbed on aluminum oxide, while molybdenum is not absorbed. 6 ref. (S11a; Ti, *Mo*)

453-S. Cast Steel Wheel Tested to Destruction. *Commonwealth Engineer,* v. 44, July 1, 1957. p. 80-81.

Test details; results of analysis and physical tests. (S21, T23; ST, 5-10)

454-S. Measuring the Thickness of Sprayed Metal Coatings. R. E. Mansford. *Electroplating and Metal Finishing,* v. 10, July 1957, p. 208-212, 220.

Discusses problem of measuring thickness of sprayed metal coatings and compares pull-off gage, moving-iron and electromagnetic types of magnetic testers; adjustment and calibration of thickness measuring instruments. (S14, 1-2; 8-17)

455-S. Nucleonic Radiation Gage Control. *Journal of Metals,* v. 9, Aug. 1957, p. 1041.

Use of gamma radiation from radioactive isotopes for gage control in a British continuous hot strip mill. Advantages of gamma radiation over X-ray gages.
(S14e, W23, 1-2)

456-S. Digits Identify Aluminum Alloys. Donald M. White. *Magazine of Standards,* v. 28, Aug. 1957, p. 232-235.

Aluminum Assoc.'s standard system identifying wrought aluminum alloys, consisting of four digits; first digit indicates general group, second digit indicates modification of original alloy or impurity limits, last two digits identify the alloy or indicate aluminum purity. In general grouping, series 1 designates 99.00% minimum and greater, series 2 through 8 designate alloys grouped by major alloying elements, and series 9, new alloys. (S22; Al)

457-S. Control of Quality in Automation. Pt. 1. John Loxham. *Metalworking Production,* v. 101, July 26, 1957, p. 1275-1284.

Priniciples of control of stable processes; illustrates new methods automatically producing punch card records to show errors in dimensions and to provide a permanent record. (To be continued.)
(S14, 18-24)

458-S. Electrolytic Analysis of Copper Metal From Cyanide Solution. Walter O. Dow, Jr., and Gerald Bakker. *Plating,* v. 44, Sept. 1957, p. 969-970.

Accuracy and precision of the method described are within ½%. Total operating time is approximately 1 hr., 15 min. of which is spent on electrolyzing. (S11, L17; Cu)

459-S. Determination of Nickel, Magnesium, Zinc and Manganese in the Presence of Titanium by Titration With the Disodium Salt of Ethylenediamine Tetracetic Acid. B. M. Dobkina and E. P. Petrova. *Zavodskaya Laboratoriya,* v. 22, no. 5, 1956, p. 525-527. (*Henry Brutcher Translation* no. 3917.)

Procedures; error does not exceed 5%; the method is more accurate for manganese than Vollhard's or colorimetry.
(S11j; Ti, *Ni, Mg, Zn, Mn*)

460-S. Spectro-analysis of Magnesite and Openhearth Lining Materials From Solutions. N. V. Kandler, A. V. Mitroshina and I. L. Shmulenson. *Zabodskaya Laboratoriya,* v. 22, no. 4, 1957, p. 440-441. (*Henry Brutcher Translation* no. 4020.)

Description of a spectrochemical procedure for magnesia (20-95%) in magnesite and the material used for lining and repairing basic openhearth bottoms; apparatus and conditions of analysis.
(B19, S11, W18r; RM-h)

461-S. Inspection of Chromium Plates for Porosity. A. A. Polyakov and D. N. Garkunov. *Zavodskaya Laboratoriya,* v. 22, no. 4, 1956, p. 482-484. (*Henry Brutcher Translation* no. 4026.)

Importance of careful inspection of porous chromium deposits on machine parts, and difficulties encountered; description of an apparatus which fits inside a cylinder to enable the latter's inner surface to be examined at various points under a microscope.
(S13d; *Cr,* 8-12, 9-18)

462-S. (French.) **Application of Statistical Methods to the Study of Certain Problems Encountered in the Ore Treatment Industry. Pt. A. Divergence of Results in Chemical Analysis of Ores.** P. Blanquet. *Annales des Mines,* Feb. 1957, p. 96-99.

Analysis of reasons for divergence; account of tests using this and other methods for determination of Pb, Zn, Cu, Cr, Fe, S, Ag, SiO_2 and Cd.
(S11, S12; RM-n)

463-S. (French.) **Influence of Factors Involved in Foundry Production. Use of Statistical Methods.** Jean Gélain. *Fonderie,* no. 138, July 1957, p. 316-321.

Statistical methods as applied to manufacture of cast iron electric resistance grids revealed role of certain predominant factors and, consequently, which of these required special control.
(S12, E general, SGA-r, CI)

464-S. (French.) **Metallurgy and Microchemistry.** René Perrin. *Fonderie Belge,* no. 6, June 1957, p. 117-123.

Principal elements found in trace condition and their effect on quality and behavior of steels. Brief review of some present applications of microchemistry in field of pure science and in such specialties as metallurgy, petrography and biology. (S11, 2-10; ST)

465-S. (German.) **Nondestructive Testing of Castings by Ultrasonic Waves.** Günter Bierwirth. *Giesserei,* v. 44, Aug. 15 1957, p. 477-485.

Necessity of a nondestructive test for the quality of castings; physical fundamentals of the test; measurements on single and two-phase brass; measurements on cast-iron brake drums. 3 ref. (S13g; CI, Cu, 5)

466-S. (German.) **Rapid Photometric Determination of Titanium in Copper Alloys.** Hugo Wiedmann. *Zeitschrift für Metallkunde,* v. 48, July 1957, p. 410-412. (CMA)

A rapid method for the determination of titanium in copper alloys, and under suitable conditions also in steel and aluminum alloys. The method is based on the reaction between titanium and chromotropic acid and the photometric measurement of the resulting red solution. 2 ref. (S11a; Cu, *Ti*)

467-S. (Japanese.) **Spark Test for Steel.** Yamato and Morikawa. *Japan Society of Mechanical Engineers, Journal,* v. 60, July 1957, p. 756-758.

Differentiation between killed steel and rimmed steel by spark test; characteristic spark tests. (S10n; ST-c, ST-d)

468-S. (Italian.) **Classification and Testing of Cast Irons.** Alfredo Secciani. *Fonderia,* v. 6, July 1957, p. 295-306.

Detailed system of classification for steels, bronzes, alloys, etc., is proposed. "GPF 10/20" indicates a lamellar graphite iron with matrix of pearlite and 10 to 20% ferrite. Types of tests that would provide useful information to design engineers, builders, founders; application of existing test methods and standards to cast irons and castings; analysis of possible objections to classification and testing systems proposed. (S22; CI)

469-S. (Italian.) **Polarographic Analysis of Iron Ores.** Maria Lucco Borlera. *Ricerca Scientifica,* v. 27, May 1957, p. 1492-1499.

Rapid method of polarographic determination of elements such as copper, manganese, lead, arsenic, sulphur and zinc to roasted ores or pyrites; ways of eliminating possible mutual interference of elements, particularly arsenic and sulphates, in determination of lead. (S11m; Fe, RM-n)

470-S. (Spanish.) **New Method of High Precision Quantitative Spectrochemical Analysis Without Use of Internal Master. Application to Fe.** Andres Rodriguez Perez. *Instituto del Hierro y del Acero,* v. 10, Apr-June, 1957, p. 166-170.

Behavior of spectral lines of iron studied by comparing two lines of same element. Investigation was made difficult by large number of lines characteristic of Fe. 6 ref. (S11k, Fe)

471-S. (Spanish.) **Spectrochemical Analysis of Anti-Friction Alloys.** A. Sampedro Pineiro and E. Asensi Alvarez-Arenas. *Revista de Ciencia Aplicada,* v. 11, May-June, 1957, p. 193-203.

Presentation of method for analyzing Sb-Sn, Cu-Sb-Sn and Sb-Sn-Pb alloys by means of optical emission spectra. Results compared with those obtained when reference specimens are used; influence of a third element on spectral emission; problem of segregation in preparation of reference specimens. 7 ref. (S11k; Sb, Sn, Cu, Pb)

472-S. (Spanish.) **Spectrochemical Determination of Silicon in Low and High-Alloy Steels.** Hilaria Carrancio de la Plaza. *Instituto del Hierro y del Acero,* v. 10, Apr-June 1957, p. 195-199.

Comparative study of Gerlach method of quantitative determination of silicon in steels and of method of comparison of intensities of two spectral lines. Presence of a third element exerts no influence on determination of silicon in high-alloy steels when Gerlach method is used; this method is the more accurate of the two studied; line comparison method gives excellent results in zone of 0.1% to 2.85% concentration. 7 ref. (S11k; AY, *Si*)

473-S. (Spanish.) **Institute Activities: Standard Samples.** *Instituto del Hierro y del Acero,* v. 10, Apr-June 1957, p. 211.

Iron and Steel Institute will soon have available homogeneous samples of six types of carbon and alloy steels of Spanish manufacture. Each type will be packed 100 g. of chip per container, accompanied by certificate of chemical analysis, recommended methods of analysis and

technological data on the given steel. Other standard samples are in preparation. (S12h, S11; CN, AY)

474-S. Ultrasonics in the Foundry. J. Jarvis. *British Foundryman,* v. 50, Aug. 1957, p. 400-406.

Testing methods and experience in testing for and diagnosing variety of gray iron casting defects such as porosity, blowholes, shrinkage and inclusions with ultrasonic equipment. (S13g; CI, 9-17, 9-18, 9-19)

475-S. Measurament of Casting Surface Roughness. C. H. Good and C. E. McQuiston. *Foundry,* v. 85, Oct. 1957, p. 116-120.

Importance of surface finish; methods of measuring surface roughness; evaluation and criteria to be considered in selection of appropriate method; Stylus tracer method. 6 ref. (S15; 5)

476-S. An Apparatus for Determining Hydrogen Content of Titanium and Its Alloys. E. G. Fatzer. *Industrial Laboratories,* v. 8, Sept. 1957, p. 22-33. (CMA)

Equipment for determining the hydrogen content of titanium, characterized as the "warm extraction" type. Hydrogen is removed in a high vacuum and transferred to a known volume; the developed pressure is measured by a McLeod gage. The research beind the apparatus and method are discusssed, with emphasis on the Ti-H equilibrium system. 13 ref. (S11r, 1-3; Ti, *H*)

477-S. International Standard for Wrought Light Alloys. Pt. 9. Summary and Conclusions. *Light Metals,* v. 20, Aug. 1957, p. 250-252.

Tabular data giving designation or specification used for different chemical composition of wrought aluminum alloys by British, United States, Canadian, French, German, Swiss and Italian users. (S22; Al)

478-S. Development of Non-Destructive Tests for Structural Adhesive Bonds. Pt. 5. J. S. Arnold, Stanford Research Institute. (Wright Air Development Center), *U. S. Office of Technical Services,* PB 131046, 62 p. $1.75.

Tests of the ultrasonic Stub-meter performed by airframe manufacturing laboratories. Laboratory work was performed on improving the means of choosing optimum frequency ranges, probes for curved surfaces and for standard lap shear specimens, electrodes with improved wear resistance, visualization of vibration modes, effects of loading, and improved circuitry.
(S13g, 7-8, 1-3, NM-d34)

479-S. Maintaining Workmanship Standards for Quality Welding. Howard B. Cary. *Welding Journal,* v. 36, Aug. 1957, p. 773-778.

Specifications and setup precautions taken to maintain quality in weld made in mild, medium and alloy steel, at Power Shovel Co.
(S22, K general; ST)

480-S. Method of Measuring Wear in Wire Drawing Dies. Garth M. McLeod and William R. Moyers. *Western Electric Engineer,* v. 1, July 1957, p. 12-14.

A standard inspection system is described and other test methods compared.
(S general, Q9n, 1-4, W24n, F28)

481-S. (French.) **Applications of Vacuum to Analysis of Gases in Metals.** M. Hanin. *Vide,* v. 12, Mar-Apr. 1957, p. 148-161.

Applications to steelmaking; decription of a vacuum reducing apparatus and automatic general service Toepler pump used with it; possibilities of vacuum methods for metals other than steel. 15 ref.
(S11, 1-23; ST)

482-S. (German.) **Further Developments in the Determination of Phosphorus, Tungsten, Silicon-Nickel and Boron Contents of Steel Through Colorimetric Methods.** Erich Piper and Heinz Hagedorn. *Archiv für das Eisenhüttenwesen,* v. 28, July 1957, p. 373-377.

Accuracy, simplicity and economy compare favorably with spectrometers. Detailed specifications for preparation of specimens and improved working procedures are given qualitatively and quantitatively.
(S11a; ST, *P, W, Si, Ni, B*)

483-S. (German.) **Influence of Particle Size of Silicate Inclusions on the Photometric Determination of Silicon in Steel.** Wilhelm Anton Fischer and Manfred Wahlster. *Archiv für Eisenhüttenwesen,* v. 28, July 1957, p. 379-382.

Specimens contained primary silicates formed immediately after the addition of silicon and secondary silicates formed during the cooling and solidification process. The primary silicate inclusions often have a di-

ameter of 10 to 15 microns while the secondary silicates are 2 to 4 microns. Photometric determination is possible only when the size of silicate particles does not exceed 6 microns, and is not feasible where primary silicates are anticipated. (S11a; ST, *Si*)

484-S. (German.) **Quick Photometric Method for the Determination of Titanium in Copper Alloys.** Hugo Weidmann. *Zeitschrift für Metallkunde,* v. 48, July 1957, p. 410-412.

Under favorable conditions of solubility titanium in aluminum and steel alloys may also be determined; the required time for analysis is claimed to be less than 15 min. (S11a; Cu, *Ti*)

485-S. (Italian.) **Systematic Analysis of Aluminum Alloys by Means of Chromatography.** Giovanni Venturello and Anna Maria Ghe. *Annali di Chimica,* v. 47, July-Aug. 1957, p. 912-918.

Method developed for qualitative determination of principal elements present in aluminum alloys, particularly Mn, Mg, Cu, Fe, Zn, Ni and Cr, permits detection of elements present in quantities of 0.1-0.2%. Method can be extended to quantitative analysis of these alloys. (S11a; Al)

486-S. (Italian.) **The Use of Ultrasonics in Non-Destructive Testing.** Luigi Scuri. *Calore,* v. 28, May 1957, p. 197-202.

Techniques, fields of use, practical advantages, limitations of ultrasonic testing. (S13g)

487-S. (Italian.) **Liquid Flaw Detectors.** Giuseppe Finocchiaro. *Macchine,* v. 12, Aug. 1957, p. 787-799.

Magnetic particle and optical fluorescence techniques reviewed. (S13j, S13d)

488-S. (Japanese.) **Analysis of Aluminum by Gamma Rays.** Tunesabro Asada. *Metals,* v. 27, Aug. 1957, p. 638-640.

Nuclear reactors for radiography; table of photonuclear reactions; analysis of oxygen in aluminum by radiography. (S11q, 1-3; Al, *O*)

489-S. (Roumanian.) **Quantitative Determination of Lead in Tin-Base Alloys Used in Canning Industry.** N. Bruja. *Revista de Chimie,* v. 7, 1956, p. 546-550.

Removal of lead from container materials; polarographic method of metering lead to tin products; shortened analysis time for determining lead content. (S11m; Sn, *Pb*)

490-S. (Russian.) **Test for Fine Cracks in Billets and Finished Products.** Z. M. Kalinina. *Stal',* v. 17, Mar. 1957, p. 261-263.

Comparison of tests for fine cracks in billets; results of tests on step-shaped samples and of non-destructive tests on finished billets showed no correlation; discontinuance of tests of step-shaped samples recommended. (S13, 1-10; ST, 4-2, 9-22)

491-S. (Russian.) **Statistical Method of Controlling Operations in Tube Production.** I. M. Ludenskii, *Stal',* v. 17, June 1957, p. 543-547.

Method was developed as a result of an investigation of study of relation between different tube wall thickness and the average tube wall thickness. Results are given in mathematical tables and charts, and claim is made that deviations in the process are checked in time so as to improve rolling practice. (S12g, F26s)

492-S. (Spanish.) **New Colorimetric Method for Determining Phosphorus Content of Steels and Alloys.** F. Burriel Marti, V. Hernando Fernandez and J. Rodriguez Senas. *Real Sociedad Espanola de Fisica y Quimica, Anales, Serie B, Quimica,* v. 53 (B), May 1957, p. 361-368.

Method based on Burriel-Hernando method for assaying phosphorus content of soils. It was necessary to change both manner of processing sample and development of color in order to compensate for interference due to strong concentration of iron. It was not necessary, in the alloys studied, to make accessory blank tests for purpose of annulling interference of chromium or other elements. 11 ref. (S11a; ST, *P*)

493-S. **Electrolytic Extraction of Carbides From Carbon Steel.** R. W. Gurry, J. Christakos and C. D. Stricker. *American Society for Metals, Transactions,* v. 50, Preprint no. 4, 1957, 34 p.

Proposed method results in less decomposition of the carbide than other established methods. The performance of the new method upon steels tempered over a range of temperature is demonstrated. (S11f; CN, 14-18)

494-S. **Determination of Cerium in Bismuth-Base Alloys.** J. W. Edwards

and G. W. C. Milner. *Analyst,* v. 82, Aug. 1957, p. 593-594. (CMA)

A method for cerium in bismuth-base alloys was developed, based on direct titration with standard permanganate and photometric determination of the excess permanganate. Negligible interference comes from bismuth and uranium. 3 ref. (S11j; Bi, *Ce*)

495-S. (Japanese.) **Studies on the Quantitative Analysis of Carbon in Titanium and Its Alloys.** Makaaki Oda and Katsusuke Norishima. *Electrochemical Society of Japan, Journal,* v. 25, June 1957, p. 319-322. (CMA)

The combustion method used for carbon in iron and steel was studied as to analytical conditions, apparatus and the influence of co-existing chlorine in order to apply it to titanium. A number of features in the system were improved. 11 ref. (S11, Ti, *C*)

496-S. Portable Spectrometer for Identifying Metals. Louis E. Owen and Robert F. O'Connell. *Metal Progress,* v. 72, Sept. 1957, p. 94.

Instrument for identifying small samples in the laboratory, critical components of large assemblies in the field, and metal stock for fabrication of special equipment. (S11k, 1-2)

497-S. Critical Survey of the General Limitations of the Nondestructive Testing Field. D. W. Ballard. *Nondestructive Testing,* v. 15, July-Aug. 1957, p. 198-207.

26 references. (S13, S general)

498-S. Ultrasonic Testing With Lamb Waves. D. C. Worlton. *Nondestructive Testing,* v. 15, July-Aug. 1957, p. 218-222.

Lamb waves have ability to travel in thin metal sections making possible the detection of defects so near the metal surface as to be difficult to detect by conventional ultrasonic methods; possibilities of using Lamb waves in testing shapes other than plates. 4 ref. (S13g)

499-S. Accelerated Life Tests. Harry G. Romig. *Nondestructive Testing,* v. 15, July-Aug. 1957, p. 224-228.

Problems in and need for life testing. 17 ref. (S21)

500-S. Advantages and Limits of Nondestructive Testing. H. Krainer. *Nondestructive Testing,* v. 15, July-Aug. 1957, p. 234-240.

Factors to consider when selecting nondestructive testing method for revealing defects and for checking physical or mechanical properties; magnetic, radiographic and ultrasonic methods. 5 ref. (S13)

501-S. Quality Predictions on Liquid Cast Iron and Steel, Based on Optical Temperature Measurements. K. Orths. *Archiv für das Eisenhüttenwesen,* v. 27, no. 5, 1956, p. 289-295. (*Henry Brutcher Translation* no. 3803.)

Previously abstracted from original. See item 399-S, 1956. (S16, N12, CI)

502-S. (Czech.) **Polarographic Determination of Tin and Antimony in Iron and Steel.** Lubomir Brhacek. *Hutnicke Listy,* v. 12, no. 2, 1957, p. 140-141.

Method may also be used for determination of tin and antimony in copper alloys. 15 ref. (S11m; ST, Fe, *Sn, Sb*)

503-S. (Czech.) **Importance and the Influence of Electrolytes During the Isolation of Carbides From Steels.** Narcis Tietz, Vaclav Toman and Hanus Tuma. *Hutnicke Listy,* v. 12, no. 6, 1957, p. 517-521.

Investigates electrolytes from standpoint of quantitative isolation of carbides; examines iron, chromium and complex carbides isolated from steels and alloys and artificially prepared vanadium, molybdenum, tungsten, titanium, zirconium and chromium carbides with hydrochloric acid, citric acid and other materials as electrolytes. 14 ref. (S11f; ST, *C*)

504-S. (Italian.) **Systematic Analysis of Aluminum Alloys by Means of Chromatography. Note 2. Quantitative Analysis.** Giovanni Venturello and Anna Maria Ghe. *Annali di Chimica,* v. 47, July-Aug. 1957, p. 919-928.

Measurement of quantities of 0.1 to 2% of Ni, Zn and Cr, to 3% of Mn and Mg, to even higher percentages of Fe and Cu. (S11a; Al)

505-S. (Slovene.) **Contribution to the Polarographic Determinations of Lead in Barite Ores and Their Flotation Products.** Sergej Gomiscek. *Rudarsko Metalurski Zbornik,* no. 2, Summer 1957, p. 135-141.

The polarographic method for determination of lead will give good results if the samples have previously been extracted with hydrochloric acid. It is an accurate, quick and

simple method suitable for rapid determination of lead in barite ores and flotation products.
(S11m; Pb)

506-S. Extraction and Flame Spectrophotometric Determination of Chromium. H. Alden Bryan and John A. Dean. *Analytical Chemistry,* v. 29, Sept. 1957, p. 1289-1292.

Extraction with 4-methyl-2-pentanone isolates chromium in the hexavalent state from all other elements except large amounts of iron. Iron however does not interfere with flame spectrophotometric determination. Accurate measurements can be made on as little as 0.1 gamma of chromium per ml. 13 ref.
(S11a; Cr)

507-S. Separation and Determination of Tantalum. Glenn R. Waterbury and Clark E. Bricker. *Analytical Chemistry,* v. 29, Oct. 1957, p. 1474-1479.

A satisfactory procedure was developed for estimating 0.01 to 2% tantalum in uranium and plutonium alloys by combining separation of tantalum by extraction with colorimetric determination. 13 ref.
(S11f, S11a; *Ta,* U, Pu)

508-S. Determination of Sulfur in Titanium. Maurice Codell, George Norwitz and Charles Clemency. *Analytical Chemistry,* v. 29, Oct. 1957, p. 1496-1499. (CMA)

Sulphur in titanium and titanium alloys can be determined by evolution of H_2S from the sample dissolved in a mixture of HCl and HF. H_2S is absorbed in a gas train in ammoniacal cadmium chloride solution carried in two tubes. After acidifying the tube absorbate on completion of the evolution, it is titrated against a standard KIO_3 solution. Selenium and arsenic interfere but are rare in titanium alloys. The method shows high accuracy and precision. 37 ref.
(S11r; Ti, *S*)

509-S. Advances in Nondestructive Test Methods. *Metal Progress,* v. 72, Oct. 1957, p. 143-144, 222, 224.

Five individual tests are made on each tube accepted for a nuclear reactor—visual, fluorescent penetrant, X-ray, eddy current and ultrasonic. Latest devices in these fields are outlined, together with "Photostress", polarized light from a plastic sheet cemented to the part.
(S13, 1-3)

510-S. Colorimetric Assay of Titanium in Beach Sands. J. A. Corbett and D. H. Parkhurst. *Mining Magazine,* v. 97, Sept. 1957, p. 185-186. (CMA)

A colorimetric method which can be used as a routine method for the estimation of titanium in beach sands and their ore dressing products. Other elements likely to be found in such deposits (e.g., iron, chromium, manganese, vanadium and columbium) do not interfere. Accuracy is within 0.3% for concentrates containing more than 95% TiO_2 and within 1% for tailings with 0.2% TiO_2. The method described uses a Hilger "Spekker" absorptiometer. 11 ref.
(S11a; Ti, RM-n)

511-S. Nondestructive Thickness Measurement of Anodizing Using the Interference Microscope. Roger L. Saur. *Plating,* v. 44, Oct. 1957, p. 1079-1082.

New method has been found for measuring film thickness. An interference microscope with two sources of light that can be used interchangeably, one white light, the other monochromatic, permits the thickness of anodized aluminum coatings in the range 0.00005 to 0.00008 in. to be determined quickly and without damage to the coatings. (S14d, 1-3; Al, 8-23)

512-S. Liquid Steel Temperature Measurement. A Review of the Quick-Immersion Thermocouple Method. W. C. Heselwood. *Platinum Metals Review,* v. 1, Oct. 1957, p. 110-118.

Types of thermocouples, composition, design, calibration maintenance and applications. 29 ref.
(S16j, 1-3; ST, 14-10)

513-S. Surface Finish. R. E. Reason and K. S. Collart. *Product Engineering,* v. 28, Sept. 16, 1957, p. 77-83.

Characteristics of surface irregularities produced in machining metal. Mechanical and electronic methods of recording surface irregularities as found by stylus pickups. Significance of tolerances and measuring techniques. (S15)

514-S. Statistical Study on the Homogeneity of Zinc-Base Spectrographic Standards. Robert C. Frank, James E. Dallemand and David L. Fry. *Spectrochimica Acta,* v. 9, no. 4, 1957, p. 323-331.

Large numbers of spectrographic determinations were made on six heats of zinc-base standards using

a direct reading spectrograph and following predetermined pattern. Results were evaluated using a three-variable analysis of variance which indicated whether there was significant inhomogeneity of minor constituents of the alloys. When inhomogeneity was significant, Duncan test was used to find homogeneous regions in standard material which can be used satisfactorily. 6 ref. (S12j, S11k; Zn)

515-S. Sampling of Steel for Determination of Hydrogen Content. L. Bjerkerud. *Jernkontorets Annaler,* v. 141, no. 2, 1957, p. 94-99. (*Henry Brutcher Translation* no. 4028.)

Previously abstracted from original. See item 269-S, 1957. (S12h; ST, H)

516-S. Determination of Tin in Zirconium and Its Alloys. D. F. Wood and R. T. Clark. *Analyst,* v. 82, Sept. 1957, p. 624-630. (CMA)

A volumetric method based on the reduction of tin with aluminum in the presence of $TiCl_3$ and oxidation of stannous ion with standard KIO_3. 5 ref. (S11j; Zr, *Sn*)

517-S. Gravimetric Determination of Barium in Zirconium Metal and in Certain Zirconium Salts. Louis Silverman and Katherine Trego. *Analytica Chimica Acta,* v. 17, Sept. 1957, p. 280-285. (CMA)

Separation is effected by a double precipitation in HCl followed by cupferron precipitation-chloroform extraction. Barium is then determined gravimetrically as barium sulphate. 10 ref. (S11b; Zr, *Ba*)

518-S. Evaporograph Measures Interior Wall Temperatures. *Blast Furnace and Steel Plant,* v. 45, Oct. 1957, p. 1140-1141.

New thermal-imaging camera which is accurate to 1° F. at distances over three miles registers temperature differences in target areas such as blast furnaces and openhearths and makes possible the detection of worn areas through heat of friction which registers on an oilcoated membrane enclosed in the device. (S16a, 1-2; D1, D2; ST)

519-S. A Trend in Steel Plant Temperature Measurements. Charles Maloney. *Blast Furnace and Steel Plant,* v. 45, Oct. 1957, p. 1156-1158.

Hard surface pyrometer for use on surface temperatures from 100 to 2400° F. Typical applications. (S16n, 1-2; ST)

520-S. Spectrophotometric Determination of Titanium With Phenylfluorone. V. Damodaram. *Journal of Scientific and Industrial Research,* v. 16B, Aug. 1957, p. 366-369.

Determination of microgram quantities of titanium in alloys and in coatings on electrodes. The method is based on the formation of a pink complex between phenylfluorone and tetravalent titanium in acid solution. 17 ref. (S11a; Ti)

521-S. Five Minute Wet Analysis Speeds Steelmaking. Karl Jacobsen. *Modern Castings,* v. 32, Nov. 1957, p. 49.

Procedure illustrated and described. (S11; ST)

522-S. Ways to Control Temperatures Accurately and Economically. William C. West, Jr. *Precision Metal Molding,* v. 15, Nov. 1957, p. 79-80.

Brief introduction to the different types of instruments used in foundries. (S16, E general)

523-S. Polarographic Determination of Tin in Zirconium Alloys. J. T. Porter. Knolls Atomic Power Laboratory. *U. S. Atomic Energy Commission,* KAPL-M-JTP-1, May 25, 1956, 7 p. (CMA)

Fluoboric acid may be used as the solvent since it does not interfere, thus obviating the use of fuming H_2SO_4. Molybdenum does not interfere, nor does iron if reduced by iron powder prior to the polarographic analysis. (S11m; Zr, *Sn*)

524-S. Photometric Determination of Small Amounts of Aluminum in Steel Using 8-Hydroxyquinoline. T. S. Licht and A. J. Frank. Watertown Arsenal. *U. S. Office of Technical Services,* PB 131107, Nov. 1955, 18 p.

The method relies on a brief electrolysis at the mercury cathode which removes most of the iron and nearly all electro-reducible metals in the sample. Residual metallic interferences are complexed by the addition of tartrate and cyanide, and aluminum is extracted into chloroform as the 8-hydroxyquinolate. The aluminum content of the organic extract is determined spectrophotometrically at 390 millimicrons. (511a; ST, *Al*)

525-S. Hydrogen Contamination in Titanium and Titanium Alloys. Pt. 2. Comparison of Various Methods for Hydrogen Analysis. J. W. Seeger and J. A. Winstead, Wright Air Develop-

ment Center, Technical Report 54-616, *U. S. Office of Technical Services*, PB 121761, Oct. 1956, 94 p.

Cost data. Handling problems of analytical disagreement between laboratories. (S11r; Ti, *H*)

526-S. **Spectrographic Analysis of Solid Titanium.** J. A. Winstead. Wright Air Development Center, Technical Report 56-600, *U. S. Office of Technical Services*, PB 121185, May 1957, 27 p. (CMA)

Excitation conditions were established for the spectrographic analysis of solid titanium. Analytical results for a number of specimens. (S11k; Ti)

527-S. **Studies of Quantitative Methods for the Separation and Determination of Zirconium and Thorium in Magnesium Alloys.** B. A. Raby. Wright Air Development Center, *U. S. Office of Technical Services*, PB 131244, June 1957, 61 p. $1.75.

Comparative study of analytical methods for the determination of thorium and zirconium and feasibility of separating these two elements by an ion exchange. (S11f; *Zr, Th,* Mg)

528-S. (Czech.) **Rapid Methods of Analysis of Metals and Mineral Raw Materials. Pt. 3. Polarographic Determination of Vanadium in Mineral Raw Materials.** Z. Sulcek. *Chemické Listy*, v. 51, Aug. 1957, p. 1453-1456. (CMA)

The sample is calcined with sodium carbonate, whereby vanadium becomes isolated from interfering elements. It is then determined in the presence of potassium cyanide as a compound with complexone III. 16 ref. (S11m; V)

529-S. (French.) **Precise Determination of Carbon Content by a Conductivity Recorder.** Walter Koch and Hans Malissa. *Métallurgie et al Construction Mécanique*, v. 89, Sept. 1957, p. 719-727.

Process is based on the variations in the conductivity of a soda lye when gases containing carbonic acid pass through it. The difference between the conductivity of a measured path and that of a reference path is measured. Determination of carbon content of various structural compounds. Description of apparatus, calibration, control of combustion. (S11; ST, *C*)

530-S. (German.) **A Simple Method for the Separation of Titanium, Columbium and Tantalum From Hard Metals.** E. Lassner and H. Weisser. *Zeitschrift für Analytische Chemie*, v. 157, no. 5, 1957, p. 343-345. (CMA)

A simple and rapid method by precipitation with ammonia in the presence of EDTA. The relative error of the determination is not greater than ± 1%. The method is particularly suitable for operational conditions. 4 ref. (S11f; Ti, Cb, Ta)

531-S. (German.) **Chemical Preparations for Spectrochemical and Photometric Trace Determination in Metals and Ores.** Hermann Specker and Heinrich Hartkamp. *Zeitschrift für Erzbergbau und Metall-Hüttenwesen*, v. 10, Mar. 1957, p. 117-122.

Interference level and limits of detection; basic premises for concentration and concentration methods; extractive concentration. 27 ref. (S11a)

532-S. (Italian.) **Determination of Tin and Antimony in Type Metal and Antifriction Alloys.** Vincenzo Tamburrini. *Chimica e l'Industria*, v. 38, Mar. 1956, p. 183-185.

(S11; SGA-c, SGA-d, *Sn, Sb*)

533-S. (Italian.) **Quantitative Chromatographic Analysis of Cobalt in Zinc Electrolytes.** Eugenio Bertorelle and Ernestina Paglia. *Chimica e l'Industria*, v. 38, May 1956, p. 384-385.

Method based on co-precipitation of cobalt with manganese by means of sodium dithionite in ammoniacal medium and in presence of ammonium chloride. 5 ref. (S11a; Zn, *Co*)

534-S. (Japanese.) **Spectrographic Determination of Iron and Magnesium in Titanium Metal.** Yosichika Oto and Chujo Matsumoto. *Chemical Society of Japan, Journal, Industrial Chemistry Section*, v. 60, June 1957, p. 689-691. (CMA)

Quantitative spectrographic analysis of iron and magnesium in titanium was carried out using porous cup electrodes in which the solution of each sample to be analyzed was poured. By means of the spectrographic colorimetry method, iron and magnesium were determined quantitatively in the ranges 0.01-0.5% and 0.01-0.7%, respectively. 3 ref. (S11k; Ti, *Fe, Mg*)

535-S. (Japanese.) **Determination of Oxygen in Titanium by Micro Bromination Methods.** Makoto Kawane and Mitsunao Takahashi. *Journal of Jap-*

anese Chemistry, v. 11, Mar. 1957, p. 201-208. (CMA)

Comparison of the microbromination and vacuum fusion methods for determining oxygen in titanium. Advantages of the former include easier operation, accuracy, and time required for the analysis. Another advantage lies in the ability to analyze oxygen in titanium alloys which contain volatile additives such as manganese and magnesium. This is not possible with the vacuum fusion method. 23 ref. (S11r; Ti, *O*)

536-S. (Russian.) **Phosphate-Oxyquinoline Method of Separating and Volumetric Determination of Zirconium.** A. V. Vinogradov and V. S. Shpinel. *Atomnaya Energiya,* v. 3, Aug. 1957, p. 130-140. (CMA)

Combination of the known method of clean separation of zirconium from accompanying elements (except hafnium) by means of phosphate precipitation with the seldom used determination of zirconium as an oxyquinolate titrated with potassium bromate. Zirconium amounts of 2-5 mg. are determined with an accuracy up to ± 2-4%. 18 ref. (S11j; Zr)

537-S. (Russian.) **Determination of Arsenic in High-Purity Lead by Means of Complexone.** Yu. Yu. Lurie and A. N. Minenko. *Zavodskaia Laboratoria,* v. 23, July 1957, p. 785-786.

A method of quantitative determination of arsenic, present in small quantities (0.1 mg.) using Complexone-III-ethylene diamine sodium tetracetate and subsequent coprecipitation with iron hydroxide. (S11j; Pb-a, *As*)

538-S. (Russian.) **Photocolorimetric Determination of Small Quantities of Copper, Using 2, 2′ Diquinolyl.** A. L. Gershuns and Yu. V. Bashkevich. *Zavodskaia Laboratoria,* v. 23, July 1957, p. 787-788.

Few thousandths of a percent of copper can be determined, using 0.02% solution of diquinolyl in isoamyl alcohol. A detailed method is given. (S11a; Cu)

539-S. (Russian.) **Polarographic Determination of Manganese in Copper Alloys by Oxidation on Platinum Anode.** E. M. Skobets and N. I. Belinskaya. *Zavodskaia Laboratoria,* v. 23, July 1957, p. 791-793.

Method of quantitative, polarographic determination of manganese in copper alloys, using ammoniacal solution. (S11m; Cu, *Mn*)

540-S. (Russian.) **Trilonometric Determination of Magnesium in Aluminum Alloys.** L. M. Budanova and R. S. Volodarskaya. *Zavodskaia Laboratoria,* v. 23, July 1957, p. 797.

Method of magnesium titration with Trilon B. When magnesium content is not less than 0.5%, nickel is absent and manganese contents less than 0.5%, buffer solutions can be used in place of sodium diethyl dicarbamate for masking undesirable elements on titration. (S11j; Al, *Mg*)

541-S. (Russian.) **Color Method of Defectoscopy.** N. V. Khimchenko. *Zavodskaia Laboratoria,* v. 23, July 1957, p. 803-806.

A method for detecting minute imperfections on metal surfaces with the naked eye. (S13d, 9-21)

542-S. (Russian.) **Perfection of Color Defectoscopy.** S. I. Kalashnikov and N. P. Kichin. *Zavodskaia Laboratoria,* v. 23, July 1957, p. 806-808.

Composition of a red stain and a white lacquer making feasible detection of extremely fine surface cracks and intercrystal corrosion. (S13a; 9-21)

543-S. (Russian.) **Induction Method of Annealed Layer Thickness Measurement.** M. A. Kotis. *Zavodskaia Laboratoria,* v. 23, July 1957, p. 819-821.

Magnetic method of measurement of thickness of annealed steel layer. Results are compared with values obtained by metallographic measurements. (S14h; ST)

544-S. (Russian.) **Device for Ultrasonic Defectoscopy of Welded Seams.** A. K. Gurvich. *Zavodskaia Laboratoria,* v. 23, July 1957, p. 858-860.

A method of welded seam checking using standard ultrasonic defectoscopes. 6 ref. (S13g; 7-1)

545-S. (English.) **Photometric Determination of Tin in Iron and Steel. Pt. 3. Photometric Determination of Tin With Sodium Diethyldithiocarbamate.** Hidehiro Goto and Yachiyo Kakita. *Tohoku University, Science Reports of the Research Institutes,* Series A, v. 9, Aug. 1957, p. 253-261.

Tin was separated from iron by coprecipitation with manganese dioxide, then the photometric determination was made after extracting tin as its diethyldithiocarbamate complex with an organic solvent. 6 ref. (S11a; Fe, ST, *Sn*)

546-S. (German.) **Simple Method for Separation of Titanium, Columbium and Tantalum in Hard Metals.** E. Lassner. *Planseeberichte für Pulvermetallurgie,* v. 5, Aug. 1957, p. 53. (CMA)

Method consists of an ammonia precipitation in the presence of glycerin and complexone. It is rapid, accurate to within $\pm 1\%$ and particularly suitable for operational conditions. (S11j; Ti, Cb, Ta)

547-S. (Japanese.) **Studies on Simultaneous Quantitative Analysis of Carbon and Hydrogen in Titanium.** Nakaaki Oda and Katsusuke Norishima. *Electrochemical Society of Japan, Journal,* v. 25, July 1957, p. 365-368. (CMA)

Apparatus used. The chlorine in the system interferes with the combustion method used and is removed by means of granulated silver or silver net heated to 400° C. The collection ratio of the chlorine using different forms of silver is compared. 10 ref. (S11r, 1-3; Ti, *C*, *H*)

548-S. (Japanese.) **Determination of Carbon in Titanium by Microcombustion Method.** Makoto Kawane and Mitsunao Takahashi. *Journal of Japanese Chemistry,* v. 11, June 1957, p. 437-440. (CMA)

The organic microanalysis method for the determination of carbon in metallic titanium. When compared with the macrocombustion analysis method, the new method was found to be simpler in operation and not at all inferior in accuracy. 16 ref. (S11s; Ti, *C*)

549-S. (Book.) **Radiography in Modern Industry.** 2nd Ed. 136 p. 1957. Eastman Kodak Co., X-Ray Div., 343 State St., Rochester 4, N. Y. $5.

Reference manual for the professional and text for the student; X-ray and gamma-ray sources, screens, films, processing and protection. (S13e, X8g, 1-2)

SECTION T

APPLICATIONS of METALS in EQUIPMENT and INDUSTRY

1-T. High-Tensile Weldable Steel. Development of a Molybdenum-Chromium-Molybdenum-Vanadium Type for Pressure Vessels. W. Barr and I. M. MacKenzie. *Iron & Steel,* v. 29, Nov. 1956, p. 519-522.

General characteristics, response to heat treatment, notch ductility, weldability. (T26; AY,)

2-T. The Prospect for Precision Steel Castings in Aircraft. *Precision Metal Molding,* v. 14, Nov. 1956, p. 48-50, 86-87.

Possibilities of greater use of castings in aircraft for reasons of economy. Cast and wrought strengths of the commonly used alloys compared. (T24, Q23; ST, 5-12)

3-T. (Czech.) **Study of Silumin Pistons for Internal Combustion Engines.** Premysl Rys and Karel Hanak. *Slévarenstvi,* v. 4, no. 10, Oct. 1956, p. 289-297.

Tests carried out with pistons made from a silumin-type alloy to confirm the experience that pistons with bright surfaces have a greater seizing tendency than pistons with dull surfaces. (T21, Q9; Al)

4-T. (Italian.) **Characteristics of a New Light Alloy (Iridal) for Architectural Uses.** C. Panseri. *Alluminio,* v. 25, no. 10, Oct. 1956, p. 427-434.

Mechanical and structural characteristics of new heat treatable alloys containing boron. (T26; EG-a)

5-T. Special Heat of Austenitic Stainless Steel Used in the Experimental Breeder Reactor (EBR-1). Robert A. Noland and David E. Walker. *Argonne National Laboratory (U. S. Atomic Energy Commission),* ANL-5548, Oct. 1956, 16 p.

The basis for specified composition, melting procedure, reactor components employing the material. (T11; SS)

6-T. Production of Honeycomb Sandwich Structures. George D. Cremer. *Metal Progress,* v. 70, Nov. 1956, p. 81-84.

Strong light-weight structures can be made by bonding two thin sheets of a strong material to an expanded honeycomb core. Adhesives are used for low-temperature service, brazed or welded joints for high-temperature applications. (T24, K general)

7-T. Which Steel for High-Temperature Piping? E. A. Sticha. *Petroleum Refiner,* v. 35, Nov. 1956, p. 185-189.

Recent developments in connection with ferritic, chromium-molybdenum, carbon and austenitic steels. (T29, 2-12; AY)

8-T. Development of U_3Si Epsilon Phase Alloys for Use in Pressurized Water Reactors. R. A. Wolfe, W. E. Bond, W. A. Bostrom, I. Cohen and R. B. Roof, Jr. *Westinghouse Electric Corporation, Atomic Power Division, (U. S. Atomic Energy Commission),* WAPD-155, July 1956, 73 p.

General properties and corrosion behavior of U_3Si alloys both with and without protective cladding. (T11, R general; U, Si)

9-T. (French.) **The Use of Stainless Steels Other Than 18/10 in Chemical Engineering.** J. Hochmann. *Génie Chimique (Supplément:—Chimie & Industrie)* v. 76, no. 4, Oct. 1956, p. 97-105.

Shows significance of molybdenum and copper additions and the advantage of nickel-free ferrite steels and chromium-nickel manganese steels. (T29; AY, SS)

10-T. (German.) **High-Quality Cold-Deformed Concrete Reinforcing Bars Made of Converter Steel.** Hubert Hoff and Georg Fischer. *Stahl und Eisen,* v. 76, no. 22, Nov. 1, 1956, p. 1471-1479.

Use of conventional basic converter rimming steel and steel blown

with oxygen showing tensile strengths corresponding to steel St37. (T26; ST)

11-T. (Polish.) **Steel-Aluminum Trolley Wires for Transportation Systems.** Leszek Godecki. *Hutnik,* v. 23, no. 9, Sept. 1956, p. 340-343.

Replacing copper trolley wires by cheaper aluminum-steel wire. The aluminum acts as the major conductor of the current while steel provides the necessary durability. (T1; Al, ST)

12-T. (French.) **Stainless and Refractory Steels in Aircraft.** L. Guitton. *Métaux, Corrosion-Industries,* v. 31, no. 374, Oct. 1956, p. 407-417.

A survey of the alloy steel used till recently in French aeronautics. New requirements for turbines, combustion chambers and tuyeres. The problem of creep. Application of refractory steels to turbojet engines. (T24; SG-h, SS)

13-T. (French.) **Present Metallurgical Problems in the Field of Refractory Steels.** W. Siegfried. *Métaux, Corrosion-Industries,* v. 31, no. 374, Oct. 1956, p. 418-431.

Qualities required in materials used in gas turbine construction. Progress made in various test techniques and in refractory steel production. (T24, T25; SS, SG-h)

14-T. Glossary of Alloys. *Petroleum Processing,* v. 11, Dec. 1956, p. 87-88.

Lists common alloys, by general and trade names used in refinery and petrochemical plants. (T29, 11-17)

15-T. 100 Per Cent Increase in Use of Aluminum for Automobile Trim. *Automotive Industries,* v. 115, Dec. 15, 1956, p. 48-49, 142.

Aluminum used in body, transmission, power steering and many other parts, 40-45 lb. being used in average 1957 car; this is expected to increase to 150 by 1960. (T21b; Al)

16-T. Metallurgy in Music Making. H. H. Symonds. *Birmingham Metallurgical Society, Journal,* v. 36, Dec. 1956, p. 431-463.

Use of metals in strings, organ pipes, belts, whistles, wind instruments, piano frames and records. (T9r)

17-T. Fabrication of Fuel Elements for Nuclear Reactors. *Engineer,* v. 202, No. 5262, Nov. 30, 1956, p. 788-791.

Most of the fuel elements being manufactured are of the flat form. Deals with flat elements and reviews special fabrication methods required in production. (T11, G general)

18-T. Performance of Light Metals at Elevated Temperatures. Alan V. Levy. *Light Metal Age,* v. 14, Dec. 1956, p. 12-15, 37.

List of high-temperature alloys; factors involved in selecting alloys for aircraft and missile applications; fabrication of high-temperature alloys. Magnesium and titanium alloys are emphasized. (T24, T2, 2-12; Mg, Ti)

19-T. Boron Carbide Looks Promising for Nuclear Uses. Charles W. Henson. *Materials and Methods,* v. 44, Dec. 1956, p. 97-98.

Chemical and physical properties of boron carbide; forming and designing, molding and bonding for nuclear uses. (T11; B, NM-a 35)

20-T. Selecting Nickel Alloy Wire. David Schmid. *Materials and Methods,* v. 44, Dec. 1956, p. 100-105.

Detailed data and recommendations to aid in the selection of the best wire for specific applications. (T general; Ni, 4-11)

21-T. Magnesium-Thorium Alloy for High Speed Aircraft. *Materials and Methods,* v. 44, Dec. 1956, p. 139-141.

Mechanical properties at elevated temperatures and fabrication of magnesium-thorium alloy. (T24, Q general, 2-12; Mg, *Th*)

22-T. In the '57 Cars Aluminum Scores Big Gains. Kim Darby. *Modern Metals,* v. 12, Dec. 1956, p. 33-37.

Functional and ornamental use of aluminum in automobiles increased from an average of 35 lb. last year to 42 lb. for the 1957 models. (T21; Al)

23-T. Big Extruded Signs Guide Superhighway Traffic. V. H. Menking. *Modern Metals,* v. 12, Dec. 1956, p. 50-55.

Extruded interlocking aluminum panels form highway signs. (T10; Al)

24-T. Calder Hall; Metallurgical Development. *Nucleonics,* v. 14, Dec. 1956, p. s14-s15.

Casting of uranium in graphite molds chosen on economic grounds. Magnox C, with calcium omitted, selected for reactor canning. (T11, C5; U)

25-T. Glassed Steel Apparatus. John W. Cosier. *Paint Industry Magazine,* v. 71, Dec. 1956, p. 52-60.

Chemical company uses glass-lined steel vessels in manufacture of fuchsine and cresol. (T29; ST, NM-f42)

26-T. Pressure Vessel Research. F. L. Plummer. *Welding Research Council Yearbook,* 1956, p. 19-26.

Report on accomplishments, objectives, current and future work of the Pressure Vessel Research Committee. 59 ref. (T26q)

27-T. Can Beryllium Buck Brittleness to Play Major Airframe Role? George A. Hoffman. *Western Metals,* v. 14, Dec. 1956, p. 48-51.

Usage could reduce plane weight 50% but at present brittleness, toxicity and high cost are effective deterrents. (T24a; Be)

28-T. Carborundum Metals Company Products Available. H. A. Anderson. Paper from "Zirconium—Technology and Economics". Atomic Industrial Forum, p. 75-77. (CMA)

The reactor grade zirconium sponge produced by Carborundum Metals Co. discussed and the production of Hf-2% Zr sponge noted. The present production of reactor grade is adequate for AEC needs and potential needs of foreign and domestic reactor markets; immediate deliveries can be made. Exacting specifications for arc-melting and chemical analysis of zirconium are noted. It is suggested that commercial-grade zirconium be given more consideration in reactor construction where neutron absorption is subsidiary in importance. The firm also produces ZrNCN, ZrO_2, $ZrCl_4$ and zirconium powder. (T11, C5h; Zr)

29-T. Commercial Products Available. A. R. Matheson. Paper from "Zirconium—Technology and Economics". Atomic Industrial Forum, p. 89. (CMA)

The arc-melting of zirconium and uranium for fabrication into fuel elements, and the rolling of thin-gage zirconium strip are two interests of the Metals and Controls Corp. (Nuclear Products Div.). One project in the course of development is the cladding of uranium foil with zirconium strip. Scrap use in arc-melting. (T11, C5h, F23, L22; Zr, U)

30-T. Commercial Products Available. P. Lowenstein. Paper from "Zirconium—Technology and Economics". Atomic Industrial Forum, p. 93. (CMA)

Nuclear Metals, Inc., has worked for some time on zirconium under AEC contract. Research and development services are the firm's specialty but mill products are also fabricated. The two outstanding mill products formed are uranium fuel elements clad with zirconium, and the cladding of seamless zirconium tubing. Extruded tubing is much cheaper than cold finished tubing. A process of cladding iron tubing with zirconium has been developed. (T11, L22; Zr, U)

31-T. AEC Future Requirements. R. C. Dalzell. Paper from "Zirconium—Technology and Economics". Atomic Industrial Forum, p. 101-105. (CMA)

In the course of two years, zirconium needs of the AEC have risen from 175,000 to 900,000 lb. yearly. Other government agencies may also have demands for zirconium. Several types of nuclear reactors are briefly described and all are likely to require zirconium in constructions. Discussion is appended. (T11; Zr)

32-T. Industrial Requirements for Zirconium. M. F. Judkins. Paper from "Zirconium—Technology and Economics". Atomic Industrial Forum, p. 107-109. (CMA)

The potential commercial zirconium market depends mainly on its corrosion resistance. With more fabricated forms available, full-scale plant tests on the chemical behavior of zirconium may be conducted; sponge zirconium costs much less than tantalum. Present uses of zirconium in process industries include rayon spinnarets, water jet exhausters and spray nozzles. Electronic uses of zirconium are noted. The resistance of zirconium in various corrosive media is described. (T general, R general; Zr)

33-T. Characteristics of Tantalum Electrolytic Capacitors. Albert Lunchick and Emanuel Gikow. *Electrical Manufacturing,* v. 58, Dec. 1956, p. 79 + 10 pages.

Direct current leakage, dissipation factor, low-temperature characteristics, changes in high temperature, effect of overvoltage and humidity evaluated. (T1; Ta)

34-T. Titanium and Its Uses. *Industrial Finishing,* v. 9, Dec. 1956, p. 290-291. (CMA)

The food processing industry intends to use titanium in processing foods like pickles and tomatoes, while the pharmaceutical industry is attracted to titanium because decreased corrosion means less con-

tamination. The use of titanium in steam jet diffusers for environments containing HCl, in experimental auto bodies and in marine service is described. It has become increasingly important to minimize the hydrogen content, and descaling baths have been developed with this in view. The Baylig process, an electrolytic pretreatment of titanium, gives it a hard chromium coat.
(T general; Ti, 17-7)

35-T. Manufacturing Under a Microscope. *Steel,* v. 139, Dec. 17, 1956, p. 91-92.

Success of mass production of transistors dependent on close control during growth of germanium-indium alloy. (T1, C general; Ge, In)

36-T. Tooling and Gauging Forum on Technical Progress. *Steel,* v. 140, Jan. 7, 1957, p. 353-364.

Fifteen authorities each contribute a paragraph on what they find to be the most significant recent developments. Contributions include greater use of automatic gages, production use of ceramic tools.
(T6, X20)

37-T. (German.) **Carbide Tipped Cutter Drill Tools.** H. Hansherg. *Fertigungstechnik,* v. 6, Dec. 1956, p. 535-539.

A review of carbide-tipped cutter drill tools to show them in present use and for furthering their utility in industry. (T6, 6-19, 17-7)

38-T. (Pamphlet.) **1955 Suplement to the Bibliography and Abstracts on Electrical Contacts.** 41 p., 1956. American Society for Testing Materials, 1916 Race St., Philadelphia 3, Pa. (Special Technical Publications No. 56-J.) $1.00.

References on a wide variety of subjects including conductivity of thin metallic films, contacts fabricated from powdered metals, and properties of contact materials.
(T1; SGA-r)

39-T. (Report.) **Stainless Steel for Pressure Vessels.** A. Grodner. 20 p., Nov. 1956. *Welding Research Council Bulletin Series.* No. 31. $1.00.

Properties and fabrication characteristics of wrought and cast stainless steels used for pressure vessel construction to meet requirements of processing industries. (T26; SS)

40-T. (Book.) **Bearing Design and Application.** Donald F. Wilcock and E. R. Booser. 470 p., 1957. McGraw-Hill Book Co., 330 W. 42nd St., New York 18, N. Y. $12.50.

Deals with the design of bearings, the materials from which the working parts are made, and the lubricants. Rolling element bearings, slider bearings, and troubleshooting are covered. (T7d, 17-7)

41-T. (Book.) **Engineering Structural Failures.** Rolt Hammond. 224 p., 1957. Philosophical Library, Inc., 15 E. 40th St., New York 16, N. Y. $12.00.

Causes and results of failure in modern structures of various types: earthworks, dams, maritime structures, buildings, underground structures, and welded structures; lessons of failure. (T26, 7-1)

42-T. Building the Space Satellites. George H. De Groat. *American Machinist,* v. 101, Jan. 14, 1957, p. 101-106.

Procedure used in constructing the skin and framework of spherical satellite from magnesium.
(T24, G general; Mg)

43-T. Russia's Automatic Factory. Peter Trippe. *American Machinist,* v. 101, Jan. 14, 1957, p. 147-154.

Detailed description of completely automated Russian bearing factory with facilities for making 900,000 ball bearings and 600,000 roller bearings a year. (T7d, 18-24)

44-T. Magnesium Swings More Weight in Trucking. G. L. Glaza. *Iron Age,* v. 179, Jan. 17, 1957, p. 78-79.

Truck builders like magnesium because load bearing walls eliminate structural framework and give reduced structural weight and enlarged interior dimensions.
(T21; Mg)

45-T. Printing With Magnesium. *Light Metals,* v. 20, Jan. 1957, p. 10-12.

Use of magnesium for photo-engraved printing plates: process, difficulties, advantages. (T9n; Mg)

46-T. The Production of Ball and Roller Bearings. *Machinery,* v. 90, Jan. 4, 1957, p. 4-14.

Bearing-balls and rollers produced are of special high-grade carbon-chromium steel. For large races a low-carbon steel is employed.
(T7d, G general; AY, CN)

47-T. Metallurgy in the Nuclear Power Industry. W. E. Dennis. *Metallurgia,* v. 55, Jan. 1957, p. 23-26.

Metallurgical aspects of construction materials. (T11)

48-T. Anaesthetic Equipment. *Metals Industry,* v. 90, Jan. 1957, p. 7-9.

Pressure die castings in anaesthetic equipment. (T10e; 5-11)

49-T. The Protection of Chemical Process Equipment. The Use of Platinum Metals for Bursting Discs. J. M.

Pirie. *Platinum Metals Review,* v. 1, No. 1, Jan. 1957, p. 9-13.

Description, requirements and applications are discussed. 3 ref. (T29; Pt)

50-T. (English.) **Steel Structures in the Building of Ironworks and for Mining Purposes in Czechoslovakia.** G. Novotny. *Acier-Stahl-Steel,* v. 21, Dec. 1956, p. 493-498.

Illustrations with explanations. Conclusion is drawn that only steel can meet all requirements for ironwork and mining construction. (T26; ST)

51-T. (English.) **The Highest Structure in the German Federal Republic.** T. Herrnstadt. *Acier-Stahl-Steel,* v. 21, Dec. 1956, p. 499-502.

A detailed description, specifications and illustrations of the steel radio mast constructed between Bremen and Oldenburg, Germany. (T26)

52-T. (English.) **Construction of the Socony Mobil Building, New York.** *Acier-Stahl-Steel,* v. 21, Dec. 1956, p. 503-506.

Description, specifications and illustrations. (T26)

53-T. (English.) **The C.N.E.T. Boiler House at Cachan (France).** F. Vitale and J. Fichot. *Acier-Stahl-Steel,* v. 21, Dec. 1956, p. 507-510.

A detailed description, specifications and illustrations of the boiler house of the C.N.E.T. at Cachan (France), as an example of the use of self-supporting sheet-steel cladding in structures of large span. (T26; ST)

54-T. Metallurgical and Other Factors Associated With the Making of Guthega Penstock. J. E. Power. *Australasian Engineer,* v. 49, Nov. 7, 1956, p. 50-57.

Brief description of methods of penstock fabrication and application; selection and welding of steel plate; radiographic examination of penstock. (T26r, K general, S13e; ST)

55-T. Can Airframes of the Future Be Machined. J. H. Framme. *Automotive Industries,* v. 116, Jan. 1, 1957, p. 68-70, 114-116.

New materials, new processes, forgings. (T24a, G17; SGB-s, 4-1)

56-T. High-Temperature Materials: Metals and Alloys for Aircraft-Engine Construction. H. E. Gresham. *Engineering,* v. 182, Dec. 28, 1956, p. 818-820.

Poppet valve developments, precipitation hardening, steels for turbine disks, materials for gas-turbine blades and for nozzle guide vanes, and light alloys for high temperatures. (T24b; SGA-h)

57-T. Special Materials for Unusual Ball Bearing Applications. William Blinder. *General Motors Engineering, Journal,* v. 4, No. 1, Jan.-Feb.-Mar. 1957, p. 42-46.

Testing program to evaluate various bearing materials, and to help the designer in solving the problems created by the newer and more stringent requirements. (T7d, 17-1)

58-T. Aluminum for Marine Switchgear. H. F. Harvey and E. J. Dawson. *Marine Engineer,* v. 79, Dec. 1956, p. 482.

Annual review of the development of marine switchgear. (T22h, W11, 17-7; Al)

59-T. For Electrical and Chemical Equipment Try Fine Silver. Edward E. Tietz. *Materials & Methods,* v. 45, Jan. 1957, p. 110-111.

Description of grades, properties, fabrication and applications. (T29, Ti; Ag)

60-T. New Uses of Magnesium. *Materials & Methods,* v. 45, Jan. 1957, p. 112-114.

Report on some recent uses, including dictating, recording, military electronics equipment, high speed teleprinters. (T general, 17-7; Mg)

61-T. Thorium's Role in Atomic Power. John P. Howe. *Metal Progress,* v. 71, Feb. 1957, p. 97-103.

Nuclear reactions involving thorium, the reactor types which use the material, function of the thorium in these reactors, manufacture and reprocessing of thorium-base reactor components, and some of the economic factors. (T11, W11, 17-7; Th)

62-T. Non-Nuclear Uses of Thorium. W. C. Lilliendahl. *Metal Progress,* v. 71, Feb. 1957, p. 104-107.

Principal use of thorium metal in industry is very recent—for alloying with magnesium. Nearly all of the other uses are in the lighting and electronics industry, mostly as oxide. The oxide also has interesting possibilities as a refractory for very high temperature. (T1, W29, 17-7; RM-h, AD-n, Th)

63-T. Are Castings Meeting Detroit Demands? M. F. Garwood. *Modern Castings,* v. 31, Feb. 1957, p. 36-38.

Gray iron, malleable iron, ductile iron and light metals for automobile industry. (T21; CI, EG-a39, 5)

64-T. Fabricating and Testing Tubular Fuel Elements. Samuel Storch-

heim. *Nucleonics,* v. 15, Jan. 1957, p. 85-91.

Dispersion of uranium oxide, forming a tube, cladding, cold-pressure welding, temperature effect, time effect and nondestructive testing. 6 ref. (T11g, U)

65-T. Aluminum-Tin Bearings Show Little Wear After 60,000 Miles. *Scientific Lubrications,* v. 8, Dec. 1956, p. 31-33.

Chemical composition and wear according to distance traveled. (T7d, Q9n; Al, *Sn*)

66-T. A Survey of the Techniques and Equipment Used in the Production of Coins. Gilbert H. Thompson. *Sheet Metal Industries,* v. 14, Jan. 1957, p. 17-24; disc., p. 40.

Description and operation of various coining presses, equipment for inspection and counting, die making. Conclusion. (T9b, G1)

67-T. New Uses for Stainless Steels. Howard Biers. *Sheet Metal Industries,* v. 14, Jan. 1957, p. 25-34.

Current and future uses in aircraft, automotive, marine, atomic energy, architectural, domestic and steam-raising fields. (T general, 17-7; SS)

68-T. DC-8 Production Helped by Cutter Fabrication at Douglas. N. P. Cici. *Western Machinery and Steel World,* v. 48, Jan. 1957, p. 68-72.

Description of fabrication. Cutters include two-blade, four-blade, open and closed helix angle combinations, staggered tooth, forward and reverse direction of rotation, two and three-part assemblies, special end mills, shell mills and inserted blade cutters for a variety of materials. (T6n)

69-T. Steel Is in the Wild Blue Yonder. Rulon Nagely. *Western Machinery and Steel World,* v. 48, Jan. 1957, p. 96-97.

Trends and recommendations for material requirements for aircraft and missiles of the future. (T24, T2; ST)

70-T. Forged Steel Crankshafts. Harold F. Wood. *Society of Automotive Engineers, Preprint,* Jan. 1957, 10 p.

Rolling and forging processes, metallurgical quality control, heat treatment, centering and dynamic balance control, mechanical properties, modulus of elasticity and endurance limit in crankshaft design. (T21f; ST, 4-1)

71-T. (English.) **The Use of Stainless Steel in Curtain Wall Construction.** *Engenharia, Mineracao e Metalurgia,* v. 24, Sept. 1956, p. 127-131.

Structural and decorative advantages, types of stainless recommended for architectural use; waviness of large flat surfaces and methods of overcoming; factors to be considered in attaching stainless curtain to building framework; insulation. (T26; SS)

72-T. (French.) **Thorium and Fissile Elements.** R. Gibrat. *Enérgie Nucléaire,* v. 76, Oct. 1956, p. 25-31.

Comparison of properties of the three known nuclear "fuels": U^{235}, U^{233}, Pu^{239}. Review of principal problems encountered in designing plant for chemical treatment of irradiated thorium in light of separation of uranium-233 produced. (T11g, C28; U, Pu, Th)

73-T. (French.) **Stainless Steel in the Food Industries.** Paul Chave. *Industries Alimentaires et Agricoles,* no. 12, Dec. 1956, p. 869-870.

Advantages derived from the use of 18-8 stainless steel of low carbon in the storage and transportation of foodstuffs such as milk, tomatoes, fruit juices and vegetables. (T29; SS)

74-T. (German.) **Roller Bearing Steel Stock and Its Importance in the Manufacture of High-Quality Roller Bearings.** A. Naumann. *Die Technik,* v. 11, Nov. 1956, p. 767-772.

A comparison of East German and United States standards for roller bearing stock, as well as the various chacteristics of importance to its manufacture. 6 ref. (T7d; ST, 15-6)

75-T. (Russian.) **Tantalum and Columbium in the Chemical Industry.** G. V. Samsonov and V. I. Konstantinov. *Khimicheskaya Nauka i Promyshlennost,* v. 1, Sept.-Oct. 1956, p. 517-522.

Applications of columbium and tantalum. (T29; Cb, Ta)

76-T. Cast Iron Glass Moulds. *British Cast Iron Research Association, Bulletin,* v. 13, Jan. 1957, p. 629-633.

Bibliography containing abstracts of 20 papers published since February 1949. (T29, 17-7; CI)

77-T. Russian Survey, Part Five. The Moscow Automatic Ball Bearing Factory. Peter Trippe. *Metalworking Production,* v. 101, Jan. 11, 1957, p. 47-70.

Detailed description of completely automated bearing factory with ca-

pacity of 1½ million bearings a year. (T7d, 18-24)

78-T. **Fast Start for 200 Series.** *Steel,* v. 140, Feb. 11, 1957, p. 104-105.

The 200 series of low-nickel stainless is expected to find increasing use in the fields of transportation, food processing and household appliances. (T general; SS)

79-T. (French and German.) **Aluminum Posts From Thin-Walled Tapered Tubes.** Kurt Diem. *Aluminium Suisse,* v. 7, Jan. 1957, p. 3-13.

Advantages in using aluminum instead of steel in the manufacture of tapered posts and masts; methods of production and problems involved; examples of application such as lamp posts, antenna masts and electric pylons. (T26; Al)

80-T. (French and German.) **Aluminum Winding for the Coiling of the Large Electromagnets of the Geneva Cyclotron.** J. Loetscher. *Aluminium Suisse,* v. 7, Jan. 1957, p. 21-22.

Utilization of aluminum of 99.75% purity in the manufacture of two very large spools, each weighing over three tons; sketches the method of production. (T11; Al)

81-T. **Beryllium as an Aircraft Structural Material.** George A. Hoffman. *Aeronautical Engineering Review,* v. 16, Feb. 1957, p. 50-55, 82.

Study on beryllium, including structural evaluation, economic considerations and a hypothetical example with suggestions for research. 6 ref. (T24; Be, SGB-s)

82-T. **Platinum Metals in the Chemical Industries.** J. M. Pirie. *Chemical and Process Engineering,* v. 48, Jan. 1957, p. 11-14.

Platinum in the glass industry; uses in electric resistance furnaces and temperature measurements; catalytic uses. (T29, X9, 17-7; Pt)

83-T. **Aluminum and Its Alloys in Chemical Engineering.** E. Elliott. *Chemical and Process Engineering,* v. 38, Jan. 1957, p. 19-22.

Various forms of aluminum and its alloys available; developments in the application of these metals in chemical engineering. (T29; Al)

84-T. **New High-Strength Aluminum Alloy.** R. Zuech and R. G. Cron. *Light Metal Age,* Feb. 1957, p. 23-26.

42B aluminum casting alloy is designed to fulfill the need for a high-strength casting alloy with good ductility for use in critically loaded aircraft and missile structures. The alloying elements are principally silicon and magnesium with small additions of beryllium and sodium. Casting operation described. (T24, E11; Al, *Si, Mn*)

85-T. **Could Beryllium Be Used as a Structural Material?** George A. Hoffman. *Materials and Methods,* v. 45, Feb. 1957, p. 100-103.

Beryllium's lightness and high stiffness-to-weight ratio provides promising properties if the problems of brittleness, high cost, availability and toxicity are overcome. (T26, Q general; Be)

86-T. **Metal-Graphite Brush by Coated Powder Method. II.** Tatsuo Matsukata. *Osaka University, Technology Reports,* v. 6, Oct. 1955, p. 425-431.

The characteristics of metal graphite brushes manufactured with the copper-lead alloy coated graphite powder are investigated. The abrasiveness of the metal-graphite brushes manufactured with powders of copper-lead-alloy coated graphite powder is lower than that in any other brushes manufactured by usual process. 4 ref. (T1; Cu, Pb, NM-k36, 6-18)

87-T. **Specs for Missile Metals.** Edward A. Loria. *Steel,* v. 140, Feb. 25, 1957, p. 86-90.

Specific heat, thermoconductivity, thermo-expansion, melting point, mechanical properties at elevated temperatures, corrosion resistance, stress resistance and low specific gravity are properties to be considered in developing metals with metallurgical requirements needed for missile structure and plain protecting elements. (T2, P general, Q general)

88-T. **High-Speed Problems of Large Airplanes.** George S. Schaiver. *American Society of Naval Engineers, Journal,* v. 69, Feb. 1957, p. 45-50.

Great emphasis is placed on the development of titanium structures with sandwich arrangement. Temperature problems, stability and control problems for airplanes are discussed. (T24, 2-12; Ti, 7-9)

89-T. **Materials Used in Radio and Electronic Engineering. The Electrodeposition of Metals.** E. E. Webster and R. W. Stobbs. *British Institution of Radio Engineers, Journal,* v. 17, Jan. 1957, p. 35-47.

Uses of electroplated coating include decoration, corrosion protec-

tion, joining, electroforming and parts rebuilding. Brass, cadmium, chromium, copper, nickel, rhodium, silver and tin plates are employed. (T1, X15, 17-7; Cu, Cd, Cr, Ni, Rh, Ag, Sn, 8-12)

90-T. Use of Aluminum in the Chemical Industry. *Canadian Chemical Processing,* v. 41, Feb. 1957, p. 34-44.

Some information on the use and performance of aluminum alloys, and a review of aluminum corrosion tests. 17 ref. (T general, R11; Al)

91-T. Oxide Fuel Elements for High Temperatures. J. H. Handwerk and R. A. Noland. *Chemical Engineering Progress,* v. 53, Feb. 1957, p. 60F-62F.

Nuclear reactors operating in the higher temperature regions are expected to use ceramic fuel elements. Among the problems inherent in such fuels, particularly the ceramics, are high internal temperature due to poor thermal conductivity and escape of volatile fission products due to fissuring. Thoria-urania fuel elements described as corrosion resistant to water at high temperatures. (T11, R4, 2-12; Th, U, 14-18)

92-T. Titanium Carbide. W. E. Montgomery. *Machine and Tool Blue Book,* v. 52, March 1957, p. 160-161. (CMA)

Firthite Cermet Grade WF, a titanium carbide-molybdenum carbide alloy bonded with nickel, is well suited to high-speed cutting and has high wear resistance. Data on physical properties and cutting performances are tabulated. (T6, Q9n; Ti, 6-19)

93-T. The Development of Refractory Nozzle Blades for Use in High-Temperature Gas Turbines. T. H. Blakeley and R. F. Darling. *North-East Coast Institution of Engineers and Shipbuilders,* Preprint, Feb. 8, 1957, p. 231-252.

Numerous materials were tested in the laboratory under conditions designed to simulate the stress and thermal shocks that will be encountered in service. Various methods of manufacturing the required blade shapes were investigated and the shapes were modified to some extent to meet special requirements of the materials. (T7, Q10a; SGA-h)

94-T. New Uses for Tin in Nuclear Power. *Tin,* Feb. 1957, p. 29-30.

Tin and zirconium alloys for atomic power (based on a new booklet of the Malayan Tin Bureau, Washington, D.C.). (T11; Sn, Zr)

95-T. SRE Zirconium Problems. R. L. Carter. *U.S. Atomic Energy Commission,* TID-7525, Jan. 15, 1956, p. 169-186. (CMA)

Stress calculations in the zirconium moderator cans in the Sodium Reactor Experiment show strain relief through grain growth in certain areas of the cans. Tensile strengths and fatigue limits were correlated for oxygen-oxidized zirconium, oxygen-rich, sodium-oxidized zirconium, and zirconium with a hydrogen content. A parabolic rate of oxygen absorption is observed for zirconium exposed to liquid sodium below 1000° F.; the activation energy is 29,400 cal. per mole. Grain growth has been controlled through the use of cold traps for hydrogen and sodium below 950° F. (T11, N3, P12; Zr)

96-T. Preparation of Thin Tritium-Zirconium Targets. B. J. Massey. Oak Ridge National Laboratory, *U.S. Atomic Energy Commission, ORNL-2237,* Feb. 21, 1957, 8 p. (CMA)

The preparative procedure for thin, evaporated titanium-zirconium targets, used as a source of neutrons, is given. The alloying of backing metal with zirconium is considered. The most serious limitation of such targets is the inability of the zirconium to retain the impregnated tritium at high temperatures. For any long period, only 10^9 neutrons per sec. can be generated. (T11; Zr, EG-n43)

97-T. High Speed Structures Keyed to Materials. Irving Stone. *Aviation Week,* v. 66, Feb. 25, 1957, p. 80-89.

Structures for high-speed aircraft and missiles are closely keyed to basic design and the critical variables of materials in relation to high temperatures. One major question is how extensively titanium alloy is going to fit changing structural requirements. Hot-forming properties of titanium alloy and tolerance control are discussed. (T24, T2; Ti)

98-T. Work-Hardened Twisted Reinforcing Steel. Kurt Billig. *Civil Engineering,* v. 52, Feb. 1957, p. 173-175.

Design and construction of reinforced concrete from the aspects of aging, bond strength and welding properties of the steel bars. 12 ref. (T26, Q general, K9s; ST)

99-T. Aluminum Radiators. *SAE Journal,* Mar. 1957, p. 50-52.

List of characteristics of solders for brass-tube, aluminum-fin assemblies and the results of field service tests of aluminum radiators. Costs for mass production also discussed. (T21b; Al, SGA-f)

100-T. Exploring the Thermal Barrier. *Steel,* Mar. 11, 1957, v. 140, p. 154-158.

Suitability of metals for use in future aircraft. Tensile strength at high temperatures of many present and prospective commercial stainless steels, hot work die steels, titanium alloys and high-temperature alloys.
(T24, Q27a, 2-12; SS, TS-k, Ti, SGA-h)

101-T. Aircraft Gas Turbines Ten Years From Now. R. B. Johnson, Jr. *Steel,* v. 140, Mar. 18, 1957, p. 108-109.

Outlines developments necessary in high-temperature alloys for engine components, heat resisting coatings and ceramic materials to meet increasing engine temperatures over next decade. (T24b; SGA-h)

102-T. (Swedish.) Beryllium Copper—a Superior Material for Pressing and Molding Tools. Peter G. Lindberg. *Industritidningen Norden,* v. 84, Oct. 31, 1956, p. 304, 308.

Beryllium-copper used in tools for work with plastics and new metals and alloys, such as polystyrene, nylon, ethylcellulose, light metal, stainless steel, titanium and zinc.
(T6; Be, Cu)

103-T. Boron Compounds for Nuclear Applications. Gordon R. Finlay. *American Ceramic Society Bulletin,* v. 36, Mar. 1957, p. 109-111.

Development, production and application of the boron isotope, B^{10}, elemental boron, boron carbide and boron nitride are reviewed. 16 ref. (T11; B)

104-T. Dyed Anodic Finishes in Architecture. A. W. Brace. *Light Metals,* v. 20, Feb. 1957, p. 61-64.

Discussion of installations in various countries, durability, maintenance, choice of materials and light fastness. Gray, gold, and bronze are the only permanent colors, while blue, yellow, green and black have sufficient permanency for 5-10 years. 8 ref. (T26n; Al, 8-23)

105-T. New Refractories. J. Lomas. *Machinery Lloyd,* v. 29, Feb. 16, 1957, p. 91-92.

Borides, hydrides, nitrides, silicides, cermets, molybdenum alloys, titanium alloys and chromium alloys as materials for turbine blades.
(T7; Mo, Ti, Cr, 14-18, SGA-h)

106-T. Canadian Railroads Get Aluminum Freight Cars Rolling. *Modern Metals,* v. 13, Mar. 1957, p. 56-64.

Service tests confirmed ability of aluminum boxcars, hopper cars, and reefers to withstand abuse and combine advantages of light weight, corrosion resistance and low maintenance. (T23p; Al)

107-T. England's Head Wrightson Builds Big in Aluminum. R. B. W. Bolland. *Modern Metals,* v. 13, Mar. 1957, p. 76-84.

British firm applies new design concepts to large aluminum structures such as bridges, traveling cranes, roof trusses, hangar doors, and crane jibs. (T26, 17-1; Al)

108-T. Use of Aluminium Honeycomb Sandwich Construction for Commercial and Aircraft Applications. G. S. Newell. *Sheet Metal Industries,* v. 34, Mar. 1957, p. 197-202.

Production of honeycomb, mechanical properties, typical aircraft applications and possible commercial uses and design consideration. Bonding and fastening of honeycomb. (T24, K13; Al, 7-9)

109-T. (French.) Comprehensive View of Aluminum in Electricity. Pierre Jacomet. *Revue de l'Aluminium,* no. 235, Sept. 1956, p. 833-837.

Excellent physical and chemical properties of aluminum have resulted in the extension of its use in the various fields of electrical equipment and construction permitting considerable economies. Cites examples of applications. (T1; Al)

110-T. The Quantity Production of Motor Car Valves. *Machinery,* v. 90, Mar. 1, 1957, p. 475-483.

Equipment and methods at Austin Motor Co. Ltd., including oxyacetylene valve stem hardening, valve-end and face grinding operations and automatic application of stellite alloy to seating surface of exhaust valves.
(T7b, J2h, G18k, SGA-m)

111-T. Production of the Renault Dauphine. *Machinery,* v. 90, Mar. 15, 1957, p. 564-575.

Techniques and equipment used in casting, cleaning and machining automobile cylinder blocks.
(T21b, E11, L10, L12, G17)

112-T. (French.) **High-Strength Bronzes in the Aircraft Industry.** W. Richardson and L. Feigenbaum. *Métaux-Corrosion-Industries,* v. 32, Feb. 1957, p. 73-78.

Certain special cupro-alloys, impropely called bronzes, are important in aircraft by virtue of their excellent mechanical and physical properties and their resistance to corrosion. Describes the properties and applications of five special alloys: Hidurax I, Hidurax 1/12A, Hidurax 4, Hidurax Special and Hidurel 5.
(T24, Q general, Cu-s, SGA-a)

113-T. (French.) **Zip Fastener Manufacture.** J. Larroque. *Revue de l'Aluminium,* no. 238, Dec. 1956, p. 1155-1159.

Some 62% of all zippers manufactured in France are made of aluminum or aluminum alloys. Fermature Eclair Co. has adopted an aluminum alloy of 5% magnesium (Scleral) with most satisfactory results. Advantages include light weight, corrosion resistance and anodic coloring of the metal to match the color of fabrics.
(T10; Al)

114-T. (French.) **Etalu: a New Combination of Aluminum and Plastic.** Xavier Bechu. *Revue de l'Aluminium,* no. 238, Dec. 1956, p. 1165-1170.

Introduction of proportions of aluminum powder of a suitable granulometry into a wide range of plastics results in an improvement of the mechanical properties, in particular, impart resistance; properties, technology and uses of such plastics (trade name Etalu); results obtained; behavior in die casting.
(T29s; Al)

115-T. (French.) **Aluminum Conductors Insulated by Anodic Oxidation.** J. Patrie and Jean Prieux. *Revue de l'Aluminium,* no. 238, Dec. 1956, p. 1179-1188.

Aluminum wires and strips can be electrically insulated with a nonpeeling, flexible, even and homogeneous aluminum film produced by a continuous process of anodic oxidation. Advantages offered by the aluminum conductor itself and anodic insulation are cited; practical recommendations concerning calculations, control and techniques of winding and joining of conductors; survey of fields of applications, such as generators and electromagnets.
(T1, L19; Al)

116-T. (German.) **Quality Evaluation of Soft Copper Wire for Windings in the Electrical Industry.** O. Lissner. *Metall,* v. 11, Feb. 1957, p. 104-112.

Quality characteristics of copper wire in the electrical industry require high degree of softness and malleability. Influence of trace elements, especially bismuth. 11 ref.
(T1, Q23p, 1-10; Cu, *Bi*)

117-T. The Expanding Use of Aluminum in Railroad Cars. G. B. Hauser. *American Society of Mechanical Engineers, Preprint,* 57-RR-2, Apr. 1957, 5 p.

The versatility of aluminum and a short history of its use in railroad cars. Aluminum alloys currently used, including the aluminum-magnesium series, and their usefulness in welded structures. Tests of such welded structures. New plant facilities covering sheet and plate, extrusions and press forgings. The new process for "flame" cutting aluminum.
(T23p, F general, G general; Al)

118-T. New Heat on Titanium Problems. *Chemical Week,* v. 80, Apr. 13, 1957, p. 27-34. (CMA)

Titanium is still little used by chemical processing firms, but this should change as defense needs are met. Du Pont reports that chemical equipment made of titanium gives better results than test laboratory predictions would indicate. The titanium autoclaves of Calera Mining Co. make continuous cobalt refining operations possible. Cost comparisons are made with stainless steel for several kinds of parts. Experience has shown that titanium may be more easily worked than formerly thought. The scrap problem is discussed. A list of titanium fabricators is appended. (T29; Ti)

119-T. Ceramics Adapt to the Friction Field. *Design Engineering,* v. 3, Apr. 1957, p. 62-64.

New cerametallic friction material, "Cerametalix" is suitable for aircraft brake linings.
(T24b; SGA-m, 6-20)

120-T. Building the Space Satellites. George H. De Groat. *Metalworking Production,* v. 101, Mar. 8, 1957, p. 409-412.

Drawing, spinning, machining and welding operations in production of spherical space satellite from magnesium alloy.
(T24, G general, K general; Mg)

121-T. Progress Report on Ceramics —Pt. 5. Russians Put Emphasis on Ceramics. Peter Trippe. *Metalworking Production,* v. 101, Mar. 15, 1957, p. 443-447.

Report on ceramic tooling development in Russia; technique used in metallizing of ceramic tips in preparation for brazing to tool shank.
(T6n, SGA-j, 6-20)

122-T. P and WA Makes J57 Compressor of Titanium. W. H. Sharp. *SAE Journal,* v. 65, no. 5, Apr. 1957, p. 17-19. (CMA)

The J57 turbojet engine of Pratt and Whitney Aircraft Division, United Aircraft, is being produced with blading of Ti-6Al-4V. Advantages are low density and good high-temperature strength. The alloy is also used for disks and disk spacers. A-110AT is valuable for welded stationary uses (compressor cases, etc.) which are subject only to moderate stress. C-130AM and other titanium alloys have previously been used in jet engines. (T7h; Ti)

123-T. High Temperatures Cause Muffler Failure—but Coated Steels Give Promise of Longer Life. W. Chow, G. E. Nelson, P. S. Meyers and P. C. Rosanthal. *SAE Journal,* v. 65, Apr. 1957, p. 78-79.

Temperatures encountered by mufflers on over-the-road trucks were determined. Laboratory tests on various muffler materials were then made. (T21; ST, 8)

124-T. 16-15-6 Alloy Fills a Need. Martin Fleischmann. *Steel,* v. 140, Mar. 25, 1957, p. 102-105.

Possible applications of chromium-nickel-molybdenum steel alloy. Effect of tempering time, tempering temperature and quenching temperature on strength and hardness values.
(T general, Q general; SS, SGA-h)

125-T. (Italian.) **Ceramic Tools and the New Carbides.** O. G. *Macchine,* v. 12, 1957, p. 89-95.

Sequel to a previous article on the use of ceramic materials in cutting tools; proposes to clear up debated points and furnish further data on these new products.
(T6n; 6-20)

126-T. (Portuguese.) **Production and Quality of Rolled Steel for the Brazilian Automotive Industry.** Pedro Silva. *Engenharia, Mineracao e Metalurgia,* v. 25, Jan. 1957, p. 9-16.

New government program for development of automotive industry envisages 90% domestic production of truck-type requirements by July 1960, up from 40% at end of December 1956. Survey of Volta Redonda mill for supplying increasing demand, present standards, future improvements, details on properties of sheet currently being rolled.
(T21, F23)

127-T. Titanium Displaces Steel in J57 Engine. I. Stone. *Aviation Week,* v. 66, Apr. 8, 1957, p. 67, 69, 72. (CMA)

The J57 turbojet engine of Pratt and Whitney uses a compressor of Ti-6Al-4V because of the weight and corrosion problem with steel. Also, numerous engines with rotor parts of various titanium alloys have been built. The best alloy for welded stationary uses is A-110AT. Ti-6Al-4V is lighter than Ti-140A, Ti-150A and C-130AM and is currently specified for blades, disks and disk spacers. (T24b; Ti)

128-T. Role of Special Nickel-Based Alloys in the Chemical Industry. *Chemical and Process Engineering,* v. 38, Mar. 1957, p. 95-97.

The problem of choosing suitable metals for particular applications where corrosive chemicals are involved; useful summary of the properties and applications of a series of special nickel-based alloys.
(T29; Ni)

129-T. Unpainted Light-Alloy Superstructure. *Marine Engineer,* v. 80, Apr. 1957, p. 134-136.

Throughout 2½-year life, the aluminum alloy superstructure of the steamship "Sunripe" has remained unpainted. Brief description of the ship, her purpose and the performance of the alloy.
(T22g; Al)

130-T. Structural Steels for Warship Building With Some Notes on Brittle Fracture. Victor Shepheard. *North-East Coast Institution of Engineers and Shipbuilders,* Preprint, Mar. 1957, p. 301-330.

Scientific and technical developments are revolutionizing weapons, equipment and the warship hulls which carry them into service. Of

the many problems which these changes are bringing to warship design, two particular aspects, namely developments in hull structural design and structural steels, are dealt with. (T22g, Q26s; ST, SGB-s)

131-T. Use of Protective Liners in Kraft Digesters. J. A. Adam, D. E. Covey and C. H. Rimmer. *Paper Trade Journal,* Apr. 29, 1957, p. 22-28.

Three main physical variables involved in scale formation in Kraft digesters are thermal shock, circulation rate, and alkali concentration versus temperature. Mild steel and studded liners are evaluated. (T29r, R6j; CN)

132-T. Bearings for Tough Jobs—Difficult Environments, High Temperatures, Nuclear Reactors. *Steel,* v. 140, Apr. 8, 1957, p. 114-118.

Rates ball, ring, separator and sealing materials for ball bearings according to ability to withstand extremes of heat, lack of lubrication, oxidizing conditions, magnetism and use in nuclear reactors. (T7d, T10; SGA-h)

133-T. (English.) **Production of Steels for Ball Bearings.** *Aciers Fins & Speciaux,* no. 25, Mar. 1957, p. 91-92.

Analysis of the factors governing the quality of a ball bearing steel and which in turn determine homogeneity, purity and machinability. (T7d, D general, G17k; ST)

134-T. (French and German.) **Aluminum in Chemical Apparatus.** E. Moor. *Aluminium Suisse,* v. 7, Mar. 1957, p. 43-56.

Manner in which aluminum and aluminum alloys are used as materials in the chemical industry; properties of aluminum and comparison with other metals; resistance to corrosion; construction problems and design problems of aluminum; analysis of mechanical characteristics. (To be continued.) (T29; Al)

135-T. (German.) **Aluminum for Architectural and Construction Purposes.** M. Gottschalk. *Metall,* v. 11, Mar. 1957, p. 202-208.

Aluminum alloys in architecture for outside and inside applications; some alloys can be applied for construction in halls, tents, bridges, buildings, cranes and greenhouses. Description of alloys for special purposes. (T26; Al)

136-T. (Italian.) **Guide to Selection of Steels for Refineries as Related to Use Temperatures.** Giuseppe Pastonesi. *Calore,* v. 27, Dec. 1956, p. 571-576.

Steels recommended for use in four temperature categories: medium (5-300° C.); high (300-600° C.); very high (above 600° C.); low (under 5° C.). Reasons for these divisions. 14 ref. (T29; SGA-h)

137-T. (Italian.) **Nickel as a Catalyst.** *Il Nickel,* no. 66, Feb. 1957, p. 1-6.

Preface to a series of articles on specific applications of nickel catalysts. Catalytic phenomena and chemical reactions; base materials used in preparation of nickel catalysts; Raney nickel catalysts. (T29; Ni, NM-c)

138-T. Titanium in the Aircraft Industry. *Aircraft Engineering,* v. 29, Apr. 1957, p. 113-122. (CMA)

Imperial Chemical Industries called a conference of representatives of the British Government and aircraft industry. Industrial statistics were quoted. The wrought titanium forms available to the aircraft industry were described and considered. Among the discussion subjects covered were stress specifications, formability, scrap reclamation, fatigue in titanium tubes, and development of high-strength sheet alloys. British sales of titanium are analyzed. (T24, A general; Ti)

139-T. Clad Steels—Their Applications in Industrial Steel. W. E. Mullestein. *Cornell Engineer,* v. 22, Mar. 1957, p. 11-14, 36.

Designing, advantages and uses of clad steels for industry. (T general; ST, 8-16)

140-T. Titanium Used for Breech of Bomb Ejector Rack. E. A. Strate, H. A. Reesing and P. D. Goldberg. *Materials and Methods,* v. 45, May 1957, p. 158-159. (CMA)

Ti-6Al-4V is used in the breech part of bomb ejector racks for aircraft. The breech has an irregular shape and several functions. Stainless steel breeches showed heat checking and failed. The titanium breech is produced as an open die forging at 1720° F., annealed at 1300° F. for 2 hr., and furnace and air-cooled. After scale removal, the forging is heat treated at 1700° F. for 1 hr., water-quenched and aged for 3 hr. at 1000° F. Mechanical properties are tabulated. The titanium breech withstood 300 firings without heat checking. (T2k, 17-7, J general; Ti)

141-T. Titanium Used in Jet Slat Track to Reduce Weight, Inertia. H. A. Reesing, J. G. Quinn and P. D. Goldberg. *Materials and Methods,* v. 45, May 1957, p. 172-173. (CMA)

Ti-6Al-4V was used as the material in jet slat tracks for the A3D Skywarrior to reduce weight and inertia and to eliminate magnetic effects on the compass. Ti-6Al-4V was chosen because of its availability, response to heat treatment and low hydrogen embrittlement. Plating problems are eliminated and weight savings are valued at $50 per lb. (T24, 17-7; Ti)

142-T. Titanium in Modern Industry. *Mechanical World,* v. 137, May 1957, p. 221-222. (CMA)

The role of titanium in the chemical processing industry is increasing. The metal is now used for acid tanks and tubes for condensers and heat exchangers. Recommendations are given for the forging, drawing, machining and grinding of titanium. Using sharp tools and minimizing frictional heat are stressed. Carbide tools are not best for intermittent machining. Melting titanium is described. Titanium carbide is a good tool material where heat is excessive. The use of titanium carbide in jet engines is noted.
(T29, 17-7, G general; Ti)

143-T. Fabrication of Zircaloy Clad Fuel Plate Assemblies for Pressurized Water Reactors. C. A. Meyers and E. D. Baugh. *U.S. Atomic Energy Commission,* WATD-T-326(DEL), Apr. 1956, 10 p. (CMA)

The pressurized water reactor seed consists of an annular ring of enriched fuel plate clusters in a matrix of blanket clusters. The subassemblies of the fuel plates are arranged and welded in a certain configuration and are Zircaloy-clad. Each subassembly is fabricated by heliarc welding first and fusion welding afterward with the aid of a welding box filled with helium. The subassemblies are annealed after cooling. (T11g, 17-7, K1d; U, *Zr,* 8-16)

144-T. Structural Steels for Warship Building With Some Notes on Brittle Fracture. Victor Shepard. *Engineer,* v. 203, Apr. 5, 1957, p. 526-527.

The special problems in the hull strength of surface warships and submarines, with reference to the theoretical and experimental research work being undertaken. Special emphasis is given to the work on steel materials, welding and brittle fracture, the object being to avoid brittle fracture in normal structural steels and the development of high-yield steels. Development difficulties are discussed, including welding problems.
(T22g, Q26s, K general; ST)

145-T. Cutting Tools of Ceramic Oxide in Place of Sintered Hard Metal. J. Hinnueber. *Industrial Diamond Review,* v. 17, Mar. 1957, p. 50-53.

Comparative properties of aluminum oxide and hard metals.
(T6n, 17-7; 6-20)

146-T. Development of Niobium. A. B. McIntosh. *Institute of Metals, Journal,* v. 85, Apr. 1957, p. 367-372.

Columbium's properties suggest use as canning material for nuclear reactors; data on chemical, physical and mechanical properties indicate potentialities of use as structural materials for liquid metal, heat transfer units or chemical processing equipment, electrical equipment; discussion of binary columbium alloy systems. 19 ref.
(T11, T29, Ti, 17-7; Cb)

147-T. Metallurgy of Cutting Tools. Pt. 8. Improving Wear Resistance. K. G. Lewis. *Iron and Coal Trades Review,* v. 174, Mar. 29, 1957, p. 745-747.

Methods claimed to effect improvement in tool life by reducing surface friction. General properties of cemented carbides considered.
(T6n, G17; SGA-j, 6-19)

148-T. Metallurgy of Cutting Tools. Pt. 9. Design, Application, and Limitations of Cemented Carbides. K. G. Lewis. *Iron and Coal Trades Review,* v. 174, Apr. 5, 1957, p. 801-803.

Problems in the use of cemented carbide tools. Methods of grinding, brazing, shrink fitting and the mechanical holding of these tools.
(T6n, G17, 17-7; SGA-j, 6-19)

149-T. Quality-Control of Foil for Packaging. *Packaging Review,* v. 77, Apr. 1957, p. 52-56.

Accurate methods of quality control in the production of aluminum foil have been largely responsible for the success of foil as a packaging material. Raw material testing; experimental coating, rolling; climate and temperature effect.
(T10g, 17-7; Al)

150-T. Aluminum-Sheathed Cable: A Utilization Wiring System for Industrial and Domestic Distribution Which Is Being Used Extensively in Canada. Philip J. Croft. *Power Apparatus and Systems,* v. 28, Feb. 1957, p. 1525-1534.

Evaluation of a system of utilization of wiring for industrial, commercial and domestic buildings based on the use of aluminum-sheathed insulated cable and fittings. 9 ref. (T1b, 17-7; Al)

151-T. Redesigning Castings to Weldments. Omer W. Blodgett. *Product Engineering,* v. 28, Mar. 1957, p. 135-139.

Factors influencing strength, rigidity, weight and cost of machine components produced by steel weldment. Analysis of vibration and noise problems. (T7, 17-7; ST, 7-1)

152-T. Gaseous Contamination of Zircaloy-2 Cladding During Fuel Rod Fabrication by Extrusion and Drawing. H. J. Snyder. *U.S. Atomic Energy Commission,* WAPD-FE-894, June 30, 1955, 7 p. (CMA)

Hydrogen, oxygen and nitrogen analyses were made of the Zircaloy-2 cladding of fuel rods before and after extrusion, after cold drawing and after nitric acid pickling. Analyses show that there is no gaseous contamination from the fabrication process.
(T11g, 17-7, G5, G4; Zr, EG-m)

153-T. (French.) **Research on Ni-Cr and Ni-Cr-Co Alloys for Turbo Reactor Blades. Their Practical Implications.** J. Poulignier. *Revue de Nickel,* v. 23, Jan-Feb-Mar. 1957, p. 1-8.

Analysis of properties demanded by turbo reactor application; post-service examination of defects and fissures by metallic and micrographic methods. (To be continued.) 11 ref. (T7h, 17-7; SS, Ni, *Cr, Co,* 9)

154-T. (French.) **Development of Special Nickel Steels for Underground Equipment of the Lorraine Iron Mines.** E. Majois. *Revue de Nickel,* v. 23, Jan-Feb-Mar. 1957, p. 9-12.

Advantages and economies in cost and space resulting from the use of nickel steels (Ni-Cr-Mo and Ni-Cr) in loading and transport equipment and maintenance machinery. Describes AFNOR 35-NCD-14 of high nickel content now in extensive use and possessing superior mechanical characteristics.
(T28r, 17-7; AY, *Ni, Cr*)

155-T. (French.) **Pressure Vessel Design.** *Soudage et Techniques Connexes,* v. 11, Mar-Apr. 1957, p. 101-109.

Reasons why a pressure vessel might prove unstable and precautions to be taken. In the calculation of thicknesses account should be taken of a "design stress" determined from the properties of the materials used. Basis for the determination and calculation of this stress for mild and low alloy steel, as a function of service temperatures. Examination of creep curves and yield points for various steels. Precautions which guarantee complete safety.
(T26q, 17-7, Q25, 17-1, CN, AY)

156-T. (German.) **Materials for Airplane Jet Engines.** R. Krause. *Metall,* v. 11, Apr. 1957, p. 298-301.

Heat resistivity of the alloys Ti-5Cr-3Al and Ti-6Al-4V and their application for different parts of jet engines. Application of ferritic, ferritic-pearlitic and martensitic instead of austenitic steels for condensers, shafts and other jet engine parts.
(T24b, Q general, 2-12, 17-7; Ti, AY)

157-T. (Italian.) **Use of Aluminum in Agusta-Bell Model 47-G Helicopter.** *Alluminio,* v. 26, Mar. 1957, p. 112-115.

Italian firm manufacturing under Bell license makes helicopters for civilian and military use having numerous light alloy structural and mechanical parts. (T24, 17-7; Al)

158-T. Metallurgy of Cutting Tools. Pt. VI. Ceramics and Steels. K. G. Lewis. *Iron and Coal Trades Review,* v. 174, Mar. 15, 1957, p. 623-626.

Use of ceramics for cutting tools; preparation and machining of steel cutting tools; various types of tool-steel. 22 ref.
(T6n; 17-7; TS, SGA-j, 6-20)

159-T. Metallurgy of Cutting Tools. Pt. VII. Medium Alloy and High-Speed Steels. K. G. Lewis. *Iron and Coal Trades Review,* v. 174, Mar. 22, 1957, p. 689-692.

Medium alloy and high speed steels of various chemical compositions and heat treatments for use as cutting tools.
(T6n, 17-7; TS-m)

160-T. Properties of Tellurium-Alloy Lead Sheath for Power Cable. H. A. Hoover. *Power Apparatus and Systems,* v. 28, Feb. 1957, p. 1517-1525.

Tellurium-alloy lead for power cable; tensile properties, fatigue

tests, corrosion tests, creep tests and aging stability. 18 ref.
(T1b, 17-7, Q general; Te)

161-T. Atomic Power Development Associates Progress Report. R. Evans, L. Minnick, A. Boltax and R. Duncan. Nuclear Metals, Inc. *U.S. Atomic Energy Commission,* NMI-1148, Dec. 31, 1955, 30 p.

Fabrication of a fuel element using casting and forging techniques. The primary purpose was to develop a method of casting an element which contained suitable coolant passages from one of two alloys—uranium with 5% Cr (eutectic) and uranium with 2% Zr. This element was typed a "radiator" element and contained tubing 0.165 in. O.D., spaced 0.195 in. on centers.
(T11g; U, *Cr, Zr*)

162-T. Evaluation of Porous Materials for Boundary-Layer Control. D. E. Debau. Battelle Memorial Institute. (Wright Air Development Center.) *U.S. Office of Technical Services,* PB 121851, Nov. 1956, 160 p. $4.

Criteria for comparing various commercial permeable sheet materials for use in boundary-layer control associated with high-lift systems. Fibrous and perforated materials, sintered powdered metals, and woven wire mesh.
(T24, 17-7; 6-21)

163-T. (Czech.) **Operation Results of the New Economical and Heat Resisting Alloy Fe-Al Type Pyroferal and Suggestions for Its Application.** Miloslav Vyklicky. *Materialovy Sbornik,* 1956, p. 141-155.

A survey of operating tests made with machine parts cast from Pyroferal: blades for pyrite furnaces; crucibles for cementation, for aluminum, borax and bronze; grate bars for steam boilers. Based on laboratory and operating tests, a general view is given of future application of Pyroferal to various machine parts. 7 ref.
(T7, 17-7; SGA-h, Fe, Al)

164-T. (German.) **New Developments in Aluminum-Tin Alloys.** E. S. Hedges. *Aluminium,* v. 33, May 1957, p. 318-322.

Aluminum-tin-base bearing metals combine the good running properties of tin-base metals with the high endurance of leaded bronzes and can be fitted to unhardened steel shafts. However, the metal must be treated to produce the finest possible grain. (T7d, 17-7; Sn, Al)

165-T. (German.) **Reliability of Aluminum Cables.** W. Zwehl. *Aluminium,* v. 33, May 1957, p. 322-324.

Advantages of aluminum for cable sheaths and conductors.
(T1b, 17-7; Al)

166-T. (German.) **Flexibility of Aluminum Cable Sheaths.** K. H. Hahne. *Aluminium,* v. 33, May 1957, p. 325-331.

Functions of the sheath of an electrical cable; brief account of the development of aluminum cable sheaths. (T1b, 17-7; Al)

167-T. (Italian.) **Selection, Use and Preparation of Hard Alloy Tipped Tools.** Piero Lovati. *Macchine,* v. 11, March 1957, p. 215-222.

Selection of lathe tools, nature of hard alloy tips; methods of brazing tips; mounting of tools to produce desired cuts; life of such tools, cooling after use, grinding.
(T6n, 17-7; W25)

168-T. (Italian.) **Savings Through Proper Design and Specifications of Helical Springs.** Alberto Oreffice. *Macchine,* v. 12, Apr. 1957, p. 397-399.

Cost and tolerance tables for various types of steel wire. Examples of improved design, such as change from music wire to chromium-vanadium alloy for spring for aircraft fuel pump when music wire was found to have excessive play caused by high ambient temperature. (T7c, 17-7; ST, AY, 4-11)

169-T. Development and Uses of Spheroidal Graphite (Nodular) Cast Iron for Marine Applications, With Special Reference to Diesel Engines. A. G. Arnold and B. Todd. *British Cast Iron Research Assoc. Journal of Research and Development,* v. 6, Apr. 1957, p. 588-599.

Optimum properties of piston materials are given and, on this basis, high-duty cast iron, nodular cast iron and 13% chromium steel are compared. Analysis of service performance, causes of failures and further applications.
(T22h, 17-7; CI-r)

170-T. Castings in Electrical Switchgear. C. A. Hillyer. *British Cast Iron Research Assoc. Journal of Research and Development,* v. 6, Apr. 1957, p. 600-607.

Typical examples of use of castings in switchgear described and illustrated. Electrical properties of the material are considered in relation to the special needs of the electrical engineer. (T1d, 17-7; CI)

171-T. Large Iron Castings in One Branch of the Chemical Industry. G. A. J. Begg. *British Cast Iron Research Assoc. Journal of Research and Development,* v. 6, Apr. 1957, p. 608-628.

Principal requirements and defects of chemical castings. Effects of carbon, nickel, sulphur and phosphorus on the soundness, corrosion resistance and general performance of chemical plant castings. (T29, 17-7, 1-10; CI)

172-T. Welded Aluminum-Alloy Deckhouses. W. Muckle. *British Welding Journal,* v. 4, Apr. 1957, p. 161-167.

Design of deckhouse and relation to structure of ship; special problem of joining aluminum house to steel ship. Mode of construction of welded aluminum structures. 5 ref. (T22j, K general; Al, ST)

173-T. Characteristics and Application of Round, Flattened, and Locked Strand Ropes. H. Hitchen. *Canadian Mining and Metallurgical Bulletin,* v. 50, May 1957, p. 281-288.

Different types of wire ropes for various engineering and mining duties are considered with reference to tensile strength, corrosion, elasticity, safety factors and nondestructive tests. (T7g, 17-7)

174-T. Application of Sintered Oxide Cutting Tools. Louis M. DeMarco. *Iron and Steel Engineer,* v. 34, Apr. 1957, p. 87-90.

High alumina sintered oxide material for cutting tools. Best results were obtained with negative rakes and large lead angles. Also promising for use in wear applications. (T6n, 17-7; SGA-j, 6-20)

175-T. New Fasteners Beat the Heat. *Machine Design,* v. 29, May 16, 1957, p. 24-28.

A new family of fasteners for aircraft structures combines a striking 220,000-psi. tensile strength at room temperature with a startling 170,000 psi. at 900° F. (T7f, 17-7, Q27a, 2-12)

176-T. Pipeline Steels. A. B. Wilder and A. F. Aebersold. *Mechanical Engineering,* v. 79, May 1957, p. 448-453.

Review of the development of the industry with an analysis of current and future trends. (T26r, 17-7; ST)

177-T. (English.) **Steel Silo of the Pithiviers District Grain Growers' Cooperative (France).** *Acier-Stahl-Steel,* Feb. 1957, p. 55-57.

Installation built in the form of 18 steel cells of 160 tons each, using sheet steel stiffened by means of pressed ribs. (T3b, 17-7; ST)

178-T. (French.) **Zip Slide.** *Cuivre Laitons Alliages,* no. 36, Mar-Apr. 1957, p. 19-23.

Use of 65-35 U-Z 36 brass for the links and annealed U-Z 33 brass for the slides of zip fasteners. Methods of manufacture, classification of zippers and the high resistivity of brass and its excellent appearance after chemical treatment. Nickel silver is also widely used. (T10k, 17-7; Cu)

179-T. (French.) **Choice of Gear Steels and Their Heat Treatment. Pt. II.** O. Patterman. *Metallurgie et la Construction Mécanique,* v. 89, May 1957, p. 437-449.

Tables listing steels used in the United States and Europe for motor car gears; distribution of fibers in the manufacture of roughed-out toothed wheels; influence of the surface finish of gears; factors influencing choice of steel; influence of heating time and tempering temperature. (T7a, 17-7, J general; ST)

180-T. Aluminum in Freight Cars. C. O. Curell. *American Society of Mechanical Engineers,* Paper No. 57-RR-9, Apr. 1957, 12 p.

Improved aluminum alloys, fabrication methods and joining techniques now available for construction of railroad freight cars and components. (T23p, 17-7; Al)

181-T. Metallic Material Engineering and Manufacturing Aspects of New High-Speed Aircraft. E. A. Simkovich. *American Society of Mechanical Engineers,* Paper No. 57-SA-40, June 1957, 6 p. $.50.

The "bit-and-piece" method of manufacturing and assembling aircraft structure is described. The use of large integral subassemblies and structures such as castings, forgings, and honeycomb joined together by flash welding or a minimum of fasteners appears to be applicable in the great majority of cases. (T24, K general)

182-T. Materials Aspect of Some High-Temperature, Refinery-Piping Applications. E. A. Sticha. *American Society of Mechanical Engineers Transactions,* v. 79, p. 715-719.

Materials most commonly used in these applications and some problems encountered in the past ten years. (T29n, 17-7; ST, 4-10)

183-T. Material Requirements of the Australian Aircraft Industry. H. E. Arblaster. *Australasian Engineer,* no. 46, Mar. 7, 1957, p. 47-55.

Comparison of British and American aircraft steels, stainless steels and magnesium alloys. (T24, 17-7; ST, SS, Mg)

184-T. New Big-Inch Pipe Mill Is Industry's Showpiece. Eric Crawford. *Canadian Machinery,* v. 68, May 1957, p. 101-109.

Description of the new Welland plant in Ontario. Steel pipe up to 36 in. in diam. is produced and capacity is about 350,000 tons per year. (T26r, 1-2)

185-T. Molybdenum Electrodes for the Glass Industry. R. R. Freeman. *Central Glass and Ceramic Research Institute Bulletin,* v. 3, Oct-Dec. 1956, p. 187-191. (CMA)

Pure molybdenum ingots are prepared by powder metallurgical methods and "furnace sintering" at 3000° F. The electrodes are pressed with hydrostatic pressure in rubber bags or molds. The properties of molybdenum which make it suitable for use as an electrode in a glass furnace are high melting point, high-temperature strength, thermal and electrical conductivity, low coefficient of expansion, resistance to glass corrosion, and the formation of colorless oxides. The electrode must be kept immersed in molten glass to prevent oxidation; the starting-up period is the most critical. Blows and shocks to unavoidably recrystallized molybdenum should be prevented. Machining, forming and joining recommendations are given. Molybdenum powder is available at reasonable cost. (T29a, 17-7, H general; Mo)

186-T. Vikon Enameled Metal Tile. James Staples. *Compressed Air Magazine,* v. 62, May 1957, p. 130-132.

Porcelain and synthetic resin coatings bonded to light base produce durable and attractive building material. (T26n, 17-7, L27)

187-T. Use of Aluminum Alloys for Ships' Superstructures. *Corrosion Prevention and Control,* v. 4, Apr. 1957, p. 40.

Ship in service since 1954 has unpainted welded aluminum-magnesium alloy superstructure and is in excellent condition in spite of exposure. (T22j, 17-7; Al)

188-T. Corrosion Resistant Steel Tubes. T. Gibbs. *Corrosion Prevention and Control,* v. 4, Apr. 1957, p. 41-42.

Note on wide and varied application of stainless steel tubing ranging from hypodermic needles, tubes for food handling, tubes for chemical industries, aircraft structural materials and bus seat rails. (T general, 17-7; SS, 4-10)

189-T. Don't Pass up Low-Nickel Stainless. Harold Rapp. *Food Engineering,* v. 29, May 1957, p. 98-103.

The lustrous, economical Type 200's, developed to conserve scarce nickel, rate as good as the celebrated 18-8. Thus they can handle many of the toughest jobs in the food field. Type 400's also have numerous pertinent applications. (T29p, 17-7; SS)

190-T. (German.) **Experiments With Aluminum Rivets of 24-Mm. Shaft Diameter.** P. Steeg. *Aluminium,* v. 33, June 1957, p. 385-386.

The new type of rivet, developed by Krupp's at Rheinhausen, can still be driven, both in workshops and in large-scale assembly works, with the normal tools, even in shaft diameters of 20 mm. (0.8 in.) and over. Manufacture of these rivets and results of shearing and tensile tests. The rivets satisfy all the prescribed mechanical property specifications and have certain technical and economic advantages over steel rivets of the same diameter. (T7f, 17-7; Al)

191-T. Pearlitic Malleable Iron Crankshafts. Developments for the Pontiac V-8 Engine. *Automobile Engineer,* v. 47, May 1957, p. 179-181.

Mechanical properties, wear characteristics, heat treating and machinability are considered. 3 ref. (T21c, 17-7, Q general, J general, G17k; CI-s)

192-T. Ceramic Materials for Cutting Tools. *Mass Production,* v. 33, May 1957, p. 127-129.

The main constituent of "Sintox" is aluminum oxide. The finished article is extremely hard and this hardness is not reduced by any but extremely high temperatures. This immediately makes it a subject for investigation as a high-speed cutting medium. Research in this direction is encouraged by the fact that the raw materials from which it is made are readily available and

widespread about the earth's surface. (T6n; Al, 6-20)

193-T. Aircraft Materials—Present and Future. *Materials and Methods,* v. 45, May 1957, p. 126-130.

Air frame and power plant materials are discussed; notes aluminum, titanium, molybdenum, stainless steels, cermets and other materials and the oxidation, creep, fatigue resistance properties needed. (T24, 17-7)

194-T. How to Choose a Less Critical Material in Designing Military Equipment. Franklin P. Huddle. *Materials and Methods,* v. 45, June 1957, p. 107-109.

Basic principles to follow in judging relative availability of materials and description of alternative materials index of both metallic and nonmetallic materials set up to serve as guide for designing military equipment. (T2, 17-1, 17-7)

195-T. Bronze for Memorial Plaques. Robert J. Nekervis. *Materials and Methods,* v. 45, June 1957, p. 120-121.

Castings made of copper-tin alloys with small lead or zinc additions continue to provide corrosion resistance and suitable finish for use as memorial plaques.
(T9q, 17-7; Cu-s)

196-T. Economics of Aluminum in Electrical Engineering. E. G. West. *Metallurgia,* v. 55, June 1957, p. 265-270.

Economic background of case for aluminum as preferred metal in field considered. Three main sections deal with metal supplies (Al, Cu, Pb, Zn); present economics and future trends. (T1, 17-7, A4; Al)

197-T. Magnesium in Military Electronics. A. F. Maynard. *Modern Metals,* v. 13, May 1957, p. 66-68, 70.

Cites numerous examples of the use of magnesium housings and covers and structural materials in military electronics, especially in the airborne electronics field.
(T2, Ti; 17-7; Mg)

198-T. Coil Meets Foil. T. E. Lewis and J. C. Meekins. *Modern Metals,* v. 13, May 1957, p. 74-82.

Use of electromagnetic coils using aluminum foil to replace copper wire as electrical conductor offers savings on material cost and possibility of easier fabrication. (T1m, 17-7; Al)

199-T. Developing Zirconium Cans for SRE Moderator Graphite. J. A. Leppard. *Nucleonics,* v. 15, June 1957, p. 84-85. (CMA)

A series of photographs are presented to show the form, installation, welding and assembly of zirconium cans for moderator graphite. The results of stress-to-rupture tests on hafnium-free zirconium at 1000° F. are shown. (T11m, 17-7, Q3m, Zr)

200-T. Performance Characteristics of Barium Getters With Particular Reference to Their Application in Thermionic Valves. P. della Porta. *Vacuum,* v. 4, July 1954, p. 284-302.
4, July 1954, p. 284-302.

From a practical point of view it is preferable to assess getter characteristics by their absorption capacity instead of by gettering rates as defined in the past. The merits of assessing getter performance in terms of "instantaneous absorption capacity" defined in cc.-microns per sec. are discussed. Results are given for the getter performance with respect to a number of gases obtained by employing the revised method. 25 ref. (T1, 17-7; Ba)

201-T. Magnesium-Thorium Alloys as Missile Materials. Donald Mathews. *Western Aviation,* v. 37, May 1957, p. 6-8.

Observations on mechanical properties; fabrication properties; and radioactivity and toxicity. (T24e, 17-7, Q general, G general, P18; Mg, Th)

202-T. Efficiencies of Materials in Aircraft Compression Panels. Edward Z. Gray. *Western Aviation,* v. 37, May 1957, p. 9.

Comparison of structural efficiencies of beryllium, titanium, and aluminum in skin-stringer sandwich panels. (T24a; 17-7; Be, Ti, Al)

203-T. Titanium Goes Commercial —Corrosion-Free Valves Have Long Life Expectancy. *Western Metals,* v. 15, June 1957, p. 62. (CMA)

Fabri-Valve Co. of America (Portland, Ore.) is prepared to mass produce titanium valves in any style and size after 2½ years of research. The first valves are 6-in. wedge gates about 24 in. high and weighing 60 lb. Finished costs of titanium parts are now at about 3:1 compared with stainless steel. A wide use of titanium valves is expected because of their longer service life. Only about 1% of titanium mill products, out of the 10% allotted, finds its way into civilian use.
(T7b, 17-7; Ti)

204-T. Evaluation of the Quality and Uniformity of the Titanium Mill Products Received by the Aircraft Industry During 1956. F. J. Gillig and L. W. Smith. Battelle Memorial Institute, Titanium Metallurgical Laboratory. *U.S. Office of Technical Services, Report 66,* PB 121625, Mar. 1957, 75 p. (CMA)

Quality and uniformity were surveyed for titanium sheet and forgings reaching the aircraft industry in 1956. Visits were made to four titanium producers, four jet engine firms, and 16 fabricators of airframe parts. Data also presented for material produced two years earlier. (T24, 17-7, S general; Ti)

205-T. (German.) **Composition, Properties and Strength Values of American Metallic Materials for Screws and Compression Springs.** Helmut Keitel. *Draht,* v. 8, May 1957, p. 180-186.

Covers carbon steel wire, alloy steel wire, high-alloy compression steel wire (high-temperature, nonrusting), copper alloys, nickel alloys; tensile strength; setting of springs at raised temperatures; fatigue strength of springs. 5 ref. (T7c, 17-7, Q27a, Q7a; CN, AY, Cu, Ni)

206-T. (Italian.) **New 20-Lira Aluminum-Bronze Coins in Italian Monetary System.** *Alluminio,* v. 26, May 1957, p. 225-227.

A 250-million piece minting put into circulation Apr. 15, 1957. Requirements, composition, characteristics of alloys for coins; advantages of "Bronzital", titanium-aluminum-bronze alloy particularly suitable for monetary applications.
(T9a, 17-7; Cu, *Al*)

207-T. (Japanese.) **Study on Zirconium Alloys.** Y. Mishima and S. Morikawa. *Light Metals (Tokyo),* no. 23, Mar. 1957, p. 61-76. (CMA)

Work-hardening of pure zirconium and Zircaloy 6-2 and some effects of heat treatment were studied. Both optical and electron micrography of the metals are feasible. The work is preliminary to a study of the application of the metals in nuclear reactors.
(T11, 17-7, M21, 2-14; Zr)

208-T. (Portuguese.) **Cast Iron for Automobile Brake Drums.** Cyro Guimaraes. *ABM-Noticiario,* v. 11, June 1957, p. 2-4.

Production of iron of necessary mechanical properties per SAE and ASTM specifications is still a problem in Brazil. Metallurgy of pearlitic malleable cast iron is discussed and results are given of experimental runs made at Institute for Technological Research, Sao Paulo, using Detroit-type arc furnaces. 5 ref. (T21c, 17-7; E11; CI-s)

209-T. (Swedish.) **Aluminum Siding on Houses.** Carl-Erik Lindgren. *Teknisk Tidskrift,* v. 87, Jan. 22, 1957, p. 67-71.

Surface treatment of external walls. Aluminum sheets (0.25 mm.) are used as covering and as a base for resistant, baked paint.
(T26n, 17-7; Al)

210-T. Aluminum Panels Pass Fire Tests. R. W. Ricker and C. R. Manley. *Ceramic Industry,* v. 70, June 1957, p. 95-97, 148.

Composite porecelain enameled aluminum panel (light-weight concrete filled) was not damaged in fire tests (1200° F. for 6 min.) simulating a minor tunnel fire. In the more severe fire test (1200° F. for 31 min.), the panels suffered no damage except a slight downward permanent deformation. The most severe fire test (1575° F. for 29 min.) indicated that this type panel would be an effective fire barrier. (T26, 17-2, 2-12; Al)

211-T. Metals Ready for Space Vehicles. Frank LaQue. *Chemical and Engineering News,* v. 35, June 24, 1957, p. 70-72.

Heat, erosion and corrosion problems. High-temperature applications of platinum, tungsten, rhenium, molybdenum, cobalt, nickel and iron are suggested.
(T24, 17-7, 2-12; Pt. W, Re, Mo, Co, Ni, Fe)

212-T. Aluminum-Clad Copper Magnet Wire for Elevated-Temperature Use. C. L. Carlson. *Electrical Manufacturing,* v. 60, June 1957, p. 164-167.

Composite wire combines the electrical conductivity of copper with the oxidation resistance of aluminum. In the range 100 to 300° C., the loss of current-carrying ability is less than that of copper. Details of research and fabrication problems and some evaluation data for such applications as motor design are given.
(T1b, P15g, 17-7; Cu, *Al,* 8-16)

213-T. Aluminium in Electrical Engineering; Symposium on Economic and Technical Trends. *Electrical Review,* v. 161, May 24, 1957, p. 943-950.

Brief summaries of 12 papers read at a symposium arranged by the Aluminium Development Association in May 1956. Subjects include general economic considerations, physical properties of aluminum of electrical interest, aluminum in transformer construction and aluminum in the British telephone service.
(T1, 17-7; Al)

214-T. Aluminium and Electrical Engineering. *Electrical Times,* v. 132, May 23, 1957, p. 817-819.

Summarizes the papers presented and resulting discussion at a symposium held by the Aluminium Development Association in May in London. (T1, 17-7; Al)

215-T. Iron and Steel Works at Workington. *Engineer,* v. 203, May 24, 1957, p. 804-805.

Notes on equipment and methods at the plant of the Workington Iron and Steel Co., Cumberland, England, employed in the manufacture of railroad fish joints and sleeper bars. (T23, 17-7; ST)

216-T. Piston Alloys. T. O. Hunt. *Gas and Oil Power,* v. 52, May 1957, p. 122-123.

Metallurgical foundry aspects relative to the method of casting and conditions of service in oil engines with special reference to aluminum alloys having a 3.5 to 4.5% copper and a 2.5% nickel content.
(T7, 17-7; Al)

217-T. Trends in Carburetor Production. *Metal Industry,* v. 90, May 24, 1957, p. 437-440.

Illustrates complexity of Zenith VN carburetor and the advantages of zinc pressure die castings as production process for its components.
(T21b, 17-7; Zn, 5-11)

218-T. Precision Mechanisms for Telephones. *Precision Metal Molding,* v. 15, June 1957, p. 33-34.

Telephone dial governor parts made from powdered brass compact; design problems; advantages of powdered metal (copper) parts in the application. (T1, 17-7; Cu, 6-22)

219-T. Iron Powder Rings Replace Cold Rolled Steel. *Precision Metal Molding,* v. 15, June 1957, p. 44-45.

Sintered iron powder ring used as magnetic conductor in electric meters. Coining solved the "low density problem".
(T1, 17-7, G3n; Fe, 6-22)

220-T. Putting Titanium Feathers on the Firebird II. R. F. McLean. *Society of Automotive Engineers, Journal,* v. 65, June 1957, p. 28-29. (CMA)

The body of the Firebird II was made of resin-bonded titanium sheet from Republic Steel. Hand forming of the sheet was minimized because of surface cracking. Joining methods were limited to welding and resin bonding. Kirksite forms were used in the hot forming of Ti panels. Tools were preheated to 600° F., and the sheet to 920° F. The body was hand finished with abrasive blocks. The experience does not suggest titanium as an auto body material.
(T21a, 17-7, G general; Ti)

221-T. Zircaloy-2 In-Pile Tube for the NRX Central Thimble. R. M. Lieberman. *U. S. Atomic Energy Commission,* WAPD-TM-51, Apr. 1, 1957, 122 p. (CMA)

The design, fabrication and testing of the first Zircaloy-2 in-pile tube for an NRX reactor are described. The design consisted of a long piece of heavy walled Zircaloy-2 tubing closed at one end and a threaded block welded to the other; o.d. was 4.5 in. The extrusion and welding of the development and production tubes are described as are the machining and inspection processes used. Values were obtained for 70 and 650° F. for reduction in area, impact, bending, total elongation and yield and tensile strength. Results of the burst test are indicated.
(T11, 17-7, Q general; Zr)

222-T. Selected Properties of Vanadium Alloys for Reactor Application. K. F. Smith and R. J. Van Thyne. *U. S. Atomic Energy Commission,* ANL-5661, May 1957, 33 p. (CMA)

A number of vanadium-base alloys were studied for reactor application; the bulk of them were 10% Ti ternary alloys with various amounts of molybdenum, tantalum, columbium, beryllium, copper and tin. Other alloys included 2.5 Ti, 20 Ti, 5 Ti, and 1 Si. Tensile, yield and creep strengths are higher than those of stainless Type 347, except for the 1 Si alloy. The high strength would allow very thin jackets on fuel elements. Vanadium alloys are generally corrosion resistant to sodium up to 700° C. if the Na_2O content is kept down to 10 ppm., but are nonresistant to degassed water at moderately high temperatures. The thermal conductivity of the alloys is higher than that of uranium, zirconium or stainless steel. 7 ref.

(T11, 17-7, Q general, P11h, R general; V, *Ti*)

223-T. (French.) **Choice of Gear Steels and Their Heat Treatment.** O. Patterman. *Metallurgie et la Construction Mecanique,* v. 89, June 1957, p. 549-559.

Importance of the heating time and soaking of gear steels; processing diagrams; machinability; surface finish according to heat treatment; influence of the micrographic structure on machining output with carbide tools. Flame tempering. (To be continued.)
(T7a, J general; ST, 17-7)

224-T. (Japanese.) **Selection of Aluminum Alloys for Industrial Use.** Taknichi Morinaga. *Metals,* v. 27, June 1957, p. 425-429.

Mechanical and chemical properties of aluminum alloys for the construction of buildings, bridges, ships, railroad car wheels, automobiles and chemical equipment.
(T general, 17-7; Al)

225-T. (Japanese.) **Aluminum and Aluminum Alloys for Industrial Apparatus.** K. Nakayama. *Metals,* v. 27, June 1957, p. 430-437.

Types of aluminum alloys and their chemical and mechanical properties. Methods of corrosion protection against inorganic acids, ammonia, metallic chlorides, water and organic materials. Applications of aluminum alloys in the chemical industry. (T29m, 17-7; Al)

226-T. (Japanese.) **High-Silicon Aluminum Alloys for Pistons.** Tsugio Iikuma. *Metals,* v. 27, June 1957, p. 438-442.

Chemical compositions of high-silicon alloys; applications in auto industry; mechanical properties and microstructure of high-silicon alloys. 10 ref. (T21b, 17-7; Al, *Si*)

227-T. Testing of Foil-Clad Laminates for Printed Circuitry. T. D. Schlabach, E. E. Wright, A. P. Broyer and D. K. Rider. *ASTM Bulletin,* no. 222, May 1957, p. 25-30.

Utilization and applications of copper-clad laminates with special reference to printed circuitry; testing methods for evaluating the base laminate itself. (T1c, 17-7; Cu)

228-T. Material Requirements of the Australian Aircraft Industry. H. E. Arblaster. *Australasian Engineer,* no. 47, Apr. 8, 1957, p. 53-61.

Physical and mechanical properties of aluminum-base, nickel-base and copper-base alloys in the aircraft industry. 31 ref.
(T24, 17-7; Al, Ni, Cu)

229-T. Metallurgical Control in Cutting Tool Manufacture. J. G. Ritchie. *Australasian Engineer,* no. 47, Apr. 8, 1957, p. 62-70.

Principal materials used for cutting tools and their properties; principles involved in the heat treatment of high-speed steel. The quality requirements in steels for tool manufacture, with examples of the results of defects in material and production. Method of testing. 9 ref. (T6n, 17-7, J general; TS)

230-T. Supersonic Speeds Need Steel. T. M. Rohan. *Iron Age,* v. 180, July 25, 1957, p. 70-71.

Steel, particularly stainless, has a growing future as planes fly higher and faster. (T24, 17-7; ST, SS)

231-T. Role of Stainless Tubing in Atomics. Norman D. Groves. *Steel,* v. 140, May 20, 1957, p. 143-144.

Austenitic stainless steels for use in atomic applications must resist severe corrosion; technique of assembling and testing to insure service. (T11, 17-7; SS, 4-10)

232-T. Missile Design Spurs Titanium's Growth. *Steel,* v. 141, July 29, 1957, p. 148-150, 152. (CMA)

Titanium represents a solution to high-temperature problems occurring in missiles operating between Mach 2-4. Weight savings are exemplified by a fitting which was redesigned for titanium, saving 20 lb. in itself and 170 lb. in the missile. Intricate forgings are costly, but the solution has been found in welded or fastened assemblies. Extrusions combined with sheets, rivets and welds offer a detour around the shortcomings of titanium. (T24e, 17-7; Ti)

233-T. Development of Zircaloy-Clad, Discrete Burnable Poison Elements for S3g/S4G. G. F. McKittrick and W. A. Neisz. *U. S. Atomic Energy Commission,* KAPL-1726, June 15, 1957, 29 p. (CMA)

The design of the S3G/S4G reactor indicates the desirability of using discrete burnable poison element rather than a dispersed poison. Zircaloy-2 was selected as the core matrix and the cladding material for the boron poison. Experimental results show that bonded-type Zircaloy-2 clad elements were inadequate for the purpose named.
(T11, 17-7; Zr, 8-16)

234-T. (French.) **Portable Gasoline Stoves.** *Cuivre Laitons Alliages,* no. 37, May-June 1957, p. 17-18.

The use of brass in the manufacture of gasoline stoves. Deep drawing of the fuel tank; setting and soldering of the machine parts; automatic polishing of the tanks; assembling of the burner.
(T10, G4, K7, L10; Cu-n, 17-7)

235-T. (French.) **Ventilating Hoods Made of Copper.** *Cuivre Laitons Alliages,* no. 37, May-June 1957, p. 35-37.

Use in the home, combining utility and elegant appearance. Simple copper sheet, 8-mm. thick, is employed. (T10; Cu, 17-7)

236-T. (French.) **Copper and Copper Alloys in High-Tension Electric Installations.** *Cuivre Laitons Alliages,* no. 37, May-June 1957, p. 21-26.

Excellent mechanical properties of copper makes for extensive use. (T1; Cu, 17-7)

237-T. (German.) **20-Year-Old Aluminum Roof in the Black Forest.** K. A. Heine. *Aluminium,* v. 33, July 1957, p. 456-457.

The roof, (8550 sq.ft. in area), laid in 1935 on a clock factory at Villingen, was revealed in an inspection this year to be completely intact and free from corrosion. A total of 375,000 sq. ft. of aluminum roofing has been laid in the Black Forest and no reports on vibrational cracks or fatigue phenomena have been made. (T26n; Al, 17-7)

238-T. (German.) **Aluminum Roofing Over Railway Platforms.** M. Schiller. *Aluminium,* v. 33, July 1957, p. 457-458.

Over the platforms at the Gare d'Austerlitz in Paris, umbrella-like aluminum roofs have been mounted on a steel structure of supports and cross orders. (T26n; Al, 17-7)

239-T. (German.) **Some Examples of the Performance of Aluminum in Building Practice.** W. Papsdorf. *Aluminium,* v. 33, July 1957, p. 461-464.

Examples include roofs, window and door structures, balustrades, facings and nameplates.
(T26n; Al, 17-7)

240-T. (German.) **Considerations in the Building of Aluminum Bridges.** C. Marsh. *Aluminium,* v. 33, July 1957, p. 465-469.

The favorable strength-weight ratio for aluminum can save such a considerable amount of metal in bridges, where the permanent load is a considerable proportion of the total load, that the actual material costs fall below those for steel bridges. Properties of alloys suitable for bridge building; discussion of movable bridges, such as bascule bridges, swing bridges, in which the weight saving through use of aluminum naturally brings special advantages. (T26p; Al, 17-7)

241-T. (German.) **Influence of Welding Engineering on Steel Construction With Regard to Hollow Sections.** A. Dörnen. *Schweissen und Schneiden,* v. 9, June 1957, p. 235-238.

Use of hollow sections in structural work is advantageous both from the point of view of strength and resistance to corrosion. The comparison between riveted and welded, open and closed steel sections shows that the closed section scores with regard to manufacture, weight and area to be painted. The welded beam girder with hollow-section ties and struts is very economical. (T26, 7-1)

242-T. (German.) **The Bridge in Speyer: First Welded Plate Girder Bridge Over the Rhine.** W. Eichenmüller. *Schweissen und Schnieden,* v. 9, June 1957, p. 239-241.

The bridge at Speyer is the first fully welded Rhine bridge, in which only some joints for assembly on site are riveted. The use of welding is advantageous in that smooth surfaces on the main girders can be achieved without the interruptions of cross or longitudinal stiffeners. (T26p, 7-1)

243-T. (German.) **Welded High Pressure Gas Holder.** Aug. Klönne. *Schweissen und Schneiden,* v. 9, June 1957, p. 242-244.

The wall thickness of the spherical gas holder is 1.1 in. Welding operations were carried out with basic electrodes and all welds were inspected radiographically. The efficiency coefficient of the welds was increased from 0.8 to 0.9 by means of a low-temperature stress-relieving heat treatment resulting in an increase of the permissible working pressure and, therefore, of the capacity of the spherical gas holder. (T26q, 7-1)

244-T. (German.) **The Large Exhibition Hall on the Killesberg in Stuttgart as an Example of the Ever-Increasing Importance of Welding in Structural**

Steel Work. Walter Wrycza. *Schweissen und Schneiden,* v. 9, June 1957, p. 245-247.

The lattice frames of 57.5 to 72.5-m. span are fully welded as are also the roof trusses which are built as arched fully welded R-beams with a span of 12.5 m. The influence of welding upon structural steel work is noted. (T26n, 7-1)

245-T. (German.) **Low-Depth Lateral Transfer Platform in Welded Construction.** H. Sattler. *Schweissen und Schneiden,* v. 9, June 1957, p. 262-263.

The increasing exploitation of the permissible over-all dimensions for railway engines and rolling stock necessitates new ideas in the design of lateral transfer platforms. Such a platform has been designed as a beam grid construction. The longitudinal and transverse beams are completely welded and are of hollow box sections having high torsional stiffness. A longitudinal joint between the tracks is made either by a novel interlocking device between the transverse beams or by welding. (T23s, 7-1)

246-T. (German.) **Welding in Docks and Harbor Engineering.** K. Trümner. *Schweissen und Schneiden,* v. 9, June 1957, p. 270-271.

Attractive waterway structures can be produced economically with little preparatory work. The relatively high dimensional accuracies required in these structures do not create manufacturing difficulties. The wide use of welding in docks and harbor engineering is shown, and the more important manufacturing considerations discussed. (T22k, 7-1; ST)

247-T. (German.) **Some Typical Welded Designs in Boiler Construction.** E. Jahn. *Schweissen und Schneiden,* v. 9, June 1957, p. 292-294.

Importance of selection of weldable materials and welding technique in boiler construction. (T26q, 7-1)

248-T. (German.) **Automatic Welding of Alloy Steels in the Manufacture of Equipment for the Chemical Industry.** Herbert Dahms. *Schweissen und Schneiden,* v. 9, June 1957, p. 295-296.

Reactors for fuel refineries are made of sheet steel (13 Cr and 44 Mo). These reactors have a working pressure of about 50 kg. per sq. cm. and a working temperature of 510° C. The steel plates are up to 55 mm. thick. In order to obtain the conditions under which an efficiency factor of 0.9 to 1 is permissible for submerged arc welded joints certain basic requirements must be fulfilled. Multi-run welds are used and the root is gouged out. (T29n, K1e, AY, 7-1)

249-T. (German.) **Trends in the Development of Welding in Automobile and Truck Manufacture.** O. Gengenbach. *Schweissen und Schneiden,* v. 9, June 1957, p. 307-309.

Welding has to be applied in the manufacturing program in accordance with the flow of production, for example, by the use of heavy welding machines or of special welding fixtures in the power press lines. By reducing handling times and by changing from electric arc or flash butt welding to multi-spot or projection welding, efficiency can be improved. (T21a, K3)

250-T. (German.) **Welded Swivelling Bogies for Railway Rolling Stock of Light-Weight Construction.** W. Marfels. *Schweissen und Schneiden,* v. 9, June 1957, p. 315-317.

While riveted construction requires the use of open profiles, welded construction makes it possible to use torsionally stiff box sections. For a modern welded bogie for a railway coach, savings in weight of about 50% for the frame and the cradle can be achieved. Modern flame cutting methods are accurate and produce high-quality cuts. (T23p, 7-1)

251-T. (German.) **Examples of Welded Consumer Goods.** W. Brunst. *Schweissen und Schneiden,* v. 9, June 1957, p. 329-332.

When welding processes are chosen care must be taken that labor costs are low and rates of machine exploitation high. The possibility of automation must also be considered. These three features are found in resistance welding and gas-shielded fusion welding processes which are therefore most suitable for the manufacture of the products in question. They are applied in the manufacture of refrigerators, electric cookers and washing machines. 6 ref. (T10, K1, K3; 7-1)

252-T. An Introduction to Driving Springs (Tension Springs). W. Tüting. *Draht (English Edition),* no. 28, Apr. 1957, p. 24-30.

Composition and mechanical properties of spring steel strips; manufacturing, annealing and hardening methods; design and torsion characteristics of spring. (T7c; ST)

253-T. Why Not Try Titanium? H. B. Bomberger, G. T. Bedford and R. M. Lorz. *Food Engineering,* v. 29, Aug. 1957, p. 97-98, 100. (CMA)

Titanium is urged as a material for equipment in the food processing industry because of its corrosion resistance to organic acids and a variety of foods (onion, tea, etc.). Corrosion resistance of a hypochlorite filter press made of titanium is cited as an example. Applications in the presence of dilute nitric acid are noted. (T29p, 17-7; Ti)

254-T. Aluminum Cladding of Buildings. E. H. Laithwaite and E. W. Skerrey. *Journal of Applied Chemistry,* v. 7, May 1957, p. 216-231.

Installation and service precautions, corrosion resistance, laboratory and field tests, service experience. 29 ref. (T26n; Al, 8-16)

255-T. Some Aspects of the Production and Applications of Cold Forged Light-Alloy Large-Diameter Rivets. C. G. Williams. *Light Metals,* v. 20, June 1957, p. 196-198.

Rivet manufacture, closing techniques and corrosion. (T7f, 17-7; Al)

256-T. Stainless Steel. A Review of Its Advantages and Uses. P. M. Slater. *Sheet Metal Industries,* v. 34, July 1957, p. 503-516, 528.

Use of stainless steel sheet and strip in automobile industry, hospital and food handling equipment, in architectural design, tableware cutlery and consumer products. (T general, 17-7; SS)

257-T. A Look Ahead at Part Making. *Steel,* v. 141, July 29, 1957, p. 112-115.

New applications of die casting, impact extrusion, cold extrusion, cold welding, carbon dioxide welding, cold spline rolling, compacting and sintering methods for production of accessories and components of automobiles. (T21c)

258-T. Look to Aluminum Die Castings When Parts Must Be Light and Strong, Pressure Tight, Intricate, Complex, Big, and Colored. *Steel,* v. 141, Aug. 5, 1957, p. 89-92.

Aluminum die castings find increasing use as automobile accessories, components and in other fields. (T21c, 17-7; Al, 5-11)

259-T. Development of Cast Fuel Elements. H. A. Saller, R. F. Dickerson, A. W. Hare and N. E. Daniel. Battelle Memorial Institute, *U. S. Atomic Energy Commission,* BMI-983, Feb. 21, 1955, 26 p.

The feasibility of casting a bare, radiator-type fuel element of the uranium-chromium eutectic alloy (5% chromium) was investigated. Castings of both perforated-hexagonal subsections and grooved-plate longitudinal sections of the perforated-hexagon subsection of the fuel element were attempted. (T11g, 17-7, E general; U, *Cr*)

260-T. (French and English.) **Aluminum Foil in the Packaging of Soft Cheese.** E. Sutter. *Aluminium Suisse,* v. 7, May 1957, p. 114-115.

Aluminum foil has now displaced tinfoil as a packaging material. Currently 90% of all soft cheese exported from Switzerland is wrapped in aluminum foil. (T10g, 17-7; Al, 4-6)

261-T. (French and English.) **Use of Aluminum Foil in Textile Industry.** A. Morf. *Aluminium Suisse,* v. 7, May 1957, p. 122.

"Cellometal" is a composite material and is manufactured by using aluminum foil 100 by 0.012 mm. thick, rolled to a high polish and sandwiched between two transparent acetate foils. Material is slit to ribbons and is woven into fabrics and spun into threads. (T29q, 17-7; Al, 4-6)

262-T. (French and German.) **Foil in the Packaging Industry.** E. Locher. *Aluminium Suisse,* v. 7, May 1957, p. 92-97.

Excellent protection provided for the shielding of organic products from the effects of heat, air, sunlight and moisture. Types of packaging; methods; automatic-packaging machines; treatment of the foil; applications and examples. (T10g, 17-7; Al, 4-6)

263-T. (French and German.) **Aluminum Foil in the Electric Cable Industry.** G. Weissenberger. *Aluminium Suisse,* v. 7, May 1957, p. 97-100.

Electrostatic shielding of high voltage conductors by means of paper-backed aluminum foil. This method provides freedom from ionization effects inside the sheathing and su-

perior thermal stability. Other applications include the shielding of telephone cables. (T1b, 17-7; Al, 4-6)

264-T. (French and German.) **Aluminum Foil in Electric Capacitators.** G. Muriset. *Aluminium Suisse,* v. 7, May 1957, p. 100-105.

Excellent electric conductivity and tensile strength of aluminum foil. Foil must be flawless, dimensionally accurate, of high quality, uniformly etched and clean. By using foil, capacitators are produced with a smaller size and at a low cost. 4 ref. (T1e, 17-7; Al, 4-6)

265-T. (French and German.) **Aluminum Foil Used to Package Butter.** D. Stüssi. *Aluminium Suisse,* v. 7, May 1957, p. 109-114.

Foil for this purpose is 0.008 mm. thick and of 99.0 to 99.5% purity. Light paper serves as a backing and odorless paraffin with wax as a bonding agent. Several types of automatic wrapping equipment currently in use in Switzerland are described. (T10g, 17-7; Al, 4-6)

266-T. (French and German.) **Aluminum Foil for Decoration and Child Play Activity.** H. G. Waser. *Aluminium Suisse,* v. 7, May 1957, p. 120-121.

Foil as used in gift wrapping, Christmas packaging and as material for the fashioning of flowers and novelties. (T10, 17-7; Al, 4-6)

267-T. High-Temperature Strength Zirconium and Titanium-Base Alloys for Fuel Element Jacketing. Final Report. K. F. Smith and H. H. Chiswik. *U. S. Atomic Energy Commission,* ANL-5339, Feb. 1956, 15 p. (CMA)

The metals themselves are suitable as regards corrosion resistance and thermal conductivity, but additions of aluminum or tin confer greater hot strength and weldability. Zirconium-titanium was used as a binary base for ternary additions, but the resulting alloys were weak. (T11g, 17-7; Zr, Ti)

268-T. Catalytic Effect of Titanium on the Oxidation Stability of Lubricants. H. F. Campbell and M. M. Jacobson. Watertown Arsenal Laboratory, Report 401/233. *U. S. Office of Technical Services,* PB 131106, July 1955, 28 p. (CMA)

The catalytic effect of several titanium alloys on the oxidation stability of selected lubricants was studied under accelerated conditions. The Norma-Hoffmann oxygen bomb method was used.
(T29, 17-7; Ti, NM-h)

269-T. (French.) **Copper Aluminum Alloys for Use in the Chemical and Allied Industries.** Pierre Weill Couly. *Genie Chimique.* Supplement of *Chemie et Industrie,* v. 77, Apr. 1957, p. 106-113.

Metallurgy of these alloys; their resistance to corrosion, atmospheric attack, sea water, acids, bases, salts; effect of welding on corrosion resistance; resistance to pitting; effect of temperature on mechanical characteristics; weldability. It is suggested that cupro-aluminums could replace copper, stainless steel and some nickel alloys in selected applications.
(T29, A general, 17-7; Al, *Cu*)

270-T. (Italian.) **Nickel Catalysts for Hydrogenization of Oils and Greases.** *Nickel,* no. 68, June 1957, p. 7-13.

Dry, wet and Raney processes for obtaining nickel catalysts; processes and equipment used in hydrogenization, action of the catalyst, its poison effects, characteristics of hydrogenated fats. (T29, 17-7; Ni)

271-T. Uses of Lithium Metal. Walter M. Fenton, Donald L. Esmay, Ronald L. Larsen and Herbert H. Schroeder. Paper from "Symposium on Handling and Uses of the Alkali Metals". American Chemical Society, p. 16-25.

Lithium metal may be used as an alkylating agent in Grignard-type reactions in the production of synthetic vitamin A and other pharmaceutical products, as an ionic catalyst in new polymer technology, as a direct reducing agent in certain organic reactions, as a flux in new brazing techniques, as a starting point in production of metallic hydrides and boro-hydrides. 52 ref. (T29, 17-7; Li)

272-T. Materials for Helical Compression Springs for Use at Constant Deflection From 600 to 1400 F. R. G. Matters and R. E. Lochen. *American Society for Testing Materials, Proceedings,* v. 56, 1956, p. 677-686.

The relaxation characteristics of compression springs under constant deflection loading; results presented on the basis of an effective residual stress calculated from the recovery of the spring when the restrain was released. 3 ref. (T7c, 17-7)

273-T. Alloy Titanium in P and WA J57 Jet Engines. R. Hawthorne. *Aviation Age,* v. 28, Aug. 1957, p. 34-35.

Many aircraft of the Air Force and Navy use the J57 jet engine, which has titanium alloy compressor disks, disk spacers, compressor cases, blading and inlet. The 400 lb. saved in the engine mean savings of 1600-4000 lb. in the airframe. (T24b, 17-7; Ti)

274-T. Aluminum in the Electrical Industry. *Electrical Journal,* v. 158, May 24, 1957, p. 1534-1538.

Application of aluminum and its alloys in conductors and conductor accessories, as a structural material, in busbars, in cable sheaths. (T1, 17-7; Al)

275-T. Aluminum Auto Design. *Light Metal Age,* v. 15, Aug. 1957, p. 16-17.

Examples of future applications in automobile styling utilizing aluminum as devised by Kaiser Aluminum. (T21, 17-7; Al)

276-T. Application Characteristics of Titanium Bolts. Joseph Viglione. *Machine Design,* v. 29, Aug. 1957, p. 86-89. (CMA)

The operating characteristics were studied for titanium alloy bolts under load. A number of different coatings and nut materials were used to find the combination which minimized seizing and galling the most. Torque-tension relationships and bolt relaxation were tested. (T7f, 17-7, Q10; Ti)

277-T. Aluminum Boat Building. *Mechanical World and Engineering Record,* v. 137, Aug. 1957, p. 344-348.

Welding and riveting techniques. Advantages or argon arc welding, use and advantages of aluminum rivets as compared with steel rivets. (T22g, 17-7, K1d, K13n; Al)

278-T. Alloy and Special Steel in Railway Work. Hugh O'Neill. *Metallurgia,* v. 56, Aug. 1957, p. 74-76.

Applications of alloy steels to railroad track, locomotives and other rolling stock. Advantages of alloy and special steels compared with plain carbon material. 14 ref. (T23, 17-7; AY)

279-T. Manufacture and Use of Stainless Steel Bellows Expansion Joints. *Pipes and Pipelines,* v. 2, Aug. 1957, p. 24-25, 40.

Some small diameters are made from seamless drawn tube, but most bellows are made from tube, which is preformed from cold rolled sheet of controlled gage, with a longitudinal butt weld. (T26r, 17-7; SS)

280-T. A New Stainless for Atomic Energy. J. Alfred Berger and W. L. Keene. *Steel,* v. 141, Sept. 9, 1957, p. 104-107.

Use of Type 304 stainless with 1 and 2% boron additions in thermal shields and control rods of atomic reactors. Mechanical properties of boron steels; hot working, casting, forging, hot rolling and forming processes. (T11j, T11m; A general; SS, *B*)

281-T. Lithium and Other Alkali Metal Polymerization Catalysts. Frederick C. Foster and John L. Binder. Paper from "Symposium on Handling and Uses of the Alkali Metals." American Chemical Society, p. 26-33.

Lithium differs from the other alkali metals in that it directs the polymerization of butadiene or isoprene predominantly to 1, 4 addition structures. The differences in physical properties, accompanying the structural variations mentioned above, are illustrated by the example of lithium-catalyzed polybutadiene. 14 ref. (T29s, 17-7; Li)

282-T. Imagineering With Carbides. Harold York. *Tooling and Production,* v. 23, Aug. 1957, p. 77-80.

Bi-carbide tool construction permits effective use of new superhard carbides with a gain in tool life of 200 to 300%. (T6n, 17-7; 6-19)

283-T. Effectiveness of Control-Rod Materials. Russell W. Dayton. Battelle Memorial Institute. *U. S. Atomic Energy Commission,* BMI-1196, June 24, 1957, 40 p.

Effectiveness of a number of elemental materials established; the methods of calculation are expected to prove useful in the development of improved control materials by predicting combinations of materials which will possess high control effectiveness. 12 ref. (T11j, 17-7)

284-T. Wrought and Welded Ornamental Ironwork. A. W. Patz. *Welder,* v. 26, Jan-Mar. 1957, p. 11-16.

Welded iron and steel used in gates, pillars, grilles and rails. (T9q, 17-7, K general, ST, CI)

285-T. "Hot Airplane" Requires Design Ingenuity for Proper Use of High Strength Steel Alloys. Alf F. Ensrud. *Western Metals,* v. 15, Aug. 1957, p. 51-54.

Problems and means of overcoming higher density disadvantage of heat resistant materials. (T24, 17-7; ST, SGB-s)

286-T. (Brochure.) **Aluminum in Electrical Engineering.** No. AB10-5571, 72 p. May, 1957. Aluminium Development Association, 33 Grosvenor St., London, W.I.

Standards, properties, existing applications and potentialities, and joining. (T1, 17-7, S22; Al)

287-T. (French.) **Cigaret Lighters.** *Cuivre Laitons Alliages,* v. 32, July-Aug. 1957, p. 19-23.

Processes in the manufacture of miniature copper butane tanks for cigaret lighters, including degreasing, stamping and machining. (T9, 17-7; Cu)

288-T. (French.) **French Firm Develops New Ceramic Cutting Tools.** Leon Gion and Louis Perrin. *Machine Moderne,* v. 51, Aug. 1957, p. 9-20.

Description of "Ceroc" tools developed by Compagnie d'Electro-Ceramique. Square, round or triangular tool bits made of fritted ceramic material are mechanically mounted on holder; bits have two precision ground faces, each providing, by means of indexing in holder, several cutting edges. When edges are worn down, bit is discarded for a new one; exceptional wear resistance makes possible hitherto unknown cutting speeds. Manufacturing process, performance, wear qualities, use. (T6n; SGA-j, 6-20)

289-T. (French.) **Steels for Pipe Systems Operating Over 600° C.** J. Ivernel. *Revue du Nickel,* v. 23, Apr-May-June 1957, p. 31-39.

Typical service conditions; properties demanded of steels in pipes submitted to high temperatures; types of steel used; improvement of ferritic steels; modification of microstructure and chemical composition; tubes in austenitic steels. 6 ref. (To be continued.)
(T general, 17-7; AY, SS, SGA-h, 4-10)

290-T. (French.) **Research on Ni-Cr and Ni-Cr-Co Alloys Used in Turbine Blades.** (Continued.) J. Poulignier. *Revue du Nickel,* v. 23, Apr-May-June 1957, p. 40-44.

Temperature attained by the various parts of the blades; cold working; skin annealing; microstructure. 10 ref. (T7h, 17-7; SS, SGA-h)

291-T. (French.) **Lightweight Materials and Transport Vehicles. Boron.** *Revue Universelle des Mines,* v. 13, Aug. 1957, p. 364-365.

Use of aluminum, magnesium and plastics to reduce weight and price, increase efficiency of passenger vehicles; aluminum alloys for chassis, tanks, delivery trucks.
(T21, 17-7; Al, Mg)

292-T. (German and French.) **Aluminum in Chemical Equipment.** (Continued.) E. Moor. *Aluminium Suisse,* v. 7, July 1957, p. 150-164.

Aluminum and aluminum alloys used in the chemical industry; comparison of the properties of aluminum with those of other metals; resistance to corrosion; problems of construction and design; surface treatment; examples of typical uses. (T29, 17-7; Al)

293-T. Aluminum Bronzes for Marine Applications. W. Lee Williams. *American Society of Naval Engineers, Journal,* v. 69, Aug. 1957, p. 453-461.

Physical, mechanical and corrosion properties of interest to designers of shipboard machinery components. (T22m, 17-7; Cu-s, *Al*)

294-T. Manufacture of Aircraft Engine Castings. C. W. Hicks. *British Foundryman,* v. 50, Aug. 1957, p. 408-418.

Molding, coremaking, pouring and inspection details in the manufacture of iron, aluminum and magnesium castings used in jet and gas turbine airplane engines.
(T24b, 17-7, E11; Al, Mg, Fe)

295-T. Cemented Tungsten Carbides, Their Applications and Problems. Frank A. Lytton. *Indian and Eastern Engineer,* v. 120, June 1957, p. 385-388.

The more practical aspects of the usage brazing and handling of cemented carbide tips. The cutting speeds and grinding procedure appropriate to the various grades of cemented carbide are detailed.
(T6n, 17-7; W, C, 6-19)

296-T. Aluminium in Electrical Engineering. *Light Metals,* v. 20, Aug. 1957, p. 255-257.

Abstracts of papers presented at Aluminum Development Association Symposium on application of aluminum conductors to electrical transmission and electrical equipment with reference to Italian, German, French and British experience.
(T1, 17-7; Al)

297-T. Pressure Die Casting Conference—Paris. *Light Metals,* v. 20, Aug. 1957, p. 268-269.

Abstracts of papers presented on potential for application of alumi-

num die castings in automobile industry. (T21, 17-7; Al, 5-11)

298-T. Production and Applications of Aluminium Powders and Pastes. *Metal Finishing Journal,* v. 3, Aug. 1957, p. 317-322.

Application of aluminum powders as pigment for coating; nature and properties of aluminum paint. (To be concluded.) (T29c, 17-7; Al, 6-18)

299-T. Aluminum in Ships. Carl W. Leveau. *Modern Metals,* v. 13, Aug. 1957, p. 42-47.

Reviews application of aluminum in ship construction and discusses structural design and advantages in use of aluminum. (T22, 17-7; Al)

300-T. (Japanese.) **Recent Development in Atomic Fuels in United States of America.** Hashida and Taketani. *Metals,* v. 27, Aug. 1957, p. 652-656.

Uranium alloys as atomic fuels; temperature ranges of atomic fuel for the industrial use; comparison of different atomic fuels. (T11g, 17-7; U)

301-T. Industrial Applications of Titanium. G. T. Fraser, W. L. Findlay and A. G. Caterson. *Industrial and Engineering Chemistry,* v. 49, Sept. 1957, p. 75A-76A. (CMA)

Du Pont uses titanium for thermowells in nitric acid environments, Wyandotte Chemicals uses it for an impeller with organic chlorides, and PennSalt uses it for a filterpress in a hypochlorite slurry. Du Pont's pigments department uses titanium steam jet diffusers which are subject to steam and HCl corrosion. (T29, 17-7; Ti)

302-T. Applications of Light Metals. Pt. 27. *Light Metals,* v. 20, Sept. 1957, p. 294-295.

Bibliography of articles on use of aluminum in railroads and note describing applications on French trains. 18 ref. (T23, 17-7; Al)

303-T. Substituting Aluminium for Grey Iron in Multi-Cylinder Engine Blocks. *Light Metals,* v. 20, Sept. 1957, p. 303-305.

Problems and their alleviation in substituting aluminum for gray iron in engine block castings. (T21b, 17-7; Al)

304-T. (French.) **Manufacture of the Renault Dauphine. C. P.** *Machine Moderne,* v. 51, Sept. 1957, p. 25-33.

Application of automation and scientific management at Renault; operations on engine-blocks and crankshaft bearings. (T21b, 17-7)

305-T. Resistance Wire Improved by Vacuum Melting. Charles G. Gilbart. *Metal Progress,* v. 72, Sept. 1957, p. 93-94.

Vacuum melted nickel-chromium alloy is cast in chill copper molds and drawn in a conventional manner to produce inclusion free wire with reduced coefficient of resistance. (T1p, 17-7, C25; Ni, Cr)

306-T. Bearings, Lubricants, and Lubrication. A Digest of 1956 Literature. *Mechanical Engineering,* v. 79, Sept. 1957, p. 842-852.

Literature review reports investigations of theoretical and practical nature on design, lubrication, bearing materials and lubricants. Studies of boundary lubrication and lubrication in relation to metal forming and metal cutting; reviews automotive lubricants and properties of lubricants. 163 ref. (T7d; NM-h, 18-23)

307-T. Molybdenum for Aircraft Applications. *Metal Industry,* v. 91, Sept. 6, 1957, p. 193-195.

Comparison of the 100-hr. stress-rupture properties of two molybdenum-base alloys and several of the best conventional nickel and cobalt-base superalloys. Oxidation resistance and high-temperature properties are evaluated. 5 ref. (T24, 17-7, Q3m; Mo)

308-T. Tips on Design and Application of Alloy Heating Elements for Optimum Service. *Industrial Heating,* v. 24, Oct. 1957, p. 2058-2062.

Application of resistance alloys in appliances and industrial heating equipment. (T1p, T10c, 17-7; SGA-q)

309-T. Aluminium for Heating in Tankers. H. M. Walter. *Metal Industry,* v. 91, Sept. 27, 1957, p. 279-282.

Heating coils in a tanker to maintain oil at the necessary fluidity have to withstand heavy chemical and electrochemical influences from sea water and oil. Aluminum tube "Alacoil" has good ductility and robustness, efficient heat transfer, low weight, economy and corrosion resistance. 22 ref. (T22m, 17-7, R7; Al)

310-T. Atomic Fuels. Frank H. Spedding. *Metal Progress,* v. 72, Oct. 1957, p. 105-111.

Several fissionable isotopes will be available to fuel the future power reactors, and could be used as solid

metal or alloys, as a molten mixture or in liquid solution. Various coolants and moderators are also possible. To determine which combination of these can best produce economical electricity is the aim of the Atomic Energy Commission's extensive and costly developmental program. It will require years of hard work by metallurgists and other engineers.
(T11g, W11p; U, Th, 14-13)

311-T. Testing of Welded Aluminum Hopper Cars. J. F. Whiting. *Metal Progress,* v. 72, Oct. 1957, p. 125-128.

About 150 aluminum freight cars of three designs have been made by Canadian car builders. To devise improvements strain gages were placed at strategic positions on full-sized hopper cars. These are of welded construction using strong aluminum alloys, sheet and extrusions, even to the center sill. Stresses were measured during static, shake-out and impact tests simulating actual service conditions.
(T23p, 17-7, S21; Al, 17-1)

312-T. Tubes for Atoms. J. S. Rodgers. *Modern Metals,* v. 13, Sept. 1957, p. 82, 84, 86. (CMA)

Development work on the extrusion properties, cold working with ordinary equipment, and annealing, cleaning and finishing of Zircaloy tubes. (T11g, 17-7, F24, Zr, 4-10)

313-T. Corrosion and Food Manufacture. J. W. Selby. *Corrosion Prevention and Control,* v. 4, Sept. 1957, p. 37-40, 46.

Use of stainless steel, aluminum and copper and tinplate materials in the food industry.
(T29p, 17-7; SS, Al, Cu, Sn)

314-T. The Hot Airplane. H. B. Sipple and G. G. Wald. *Mechanical Engineering,* v. 79, Oct. 1957, p. 925-927.

Interrelated problems of weight, heat resistant metals, size, close tolerances and dimensional precision for high-performance supersonic aircraft. Development of essential new materials, fabrication methods and processing procedures to offset construction problems and reduce production costs seen dependent upon continued support of government-sponsored research and ingenuity of free enterprise in industry. (T24, 17-7)

315-T. Light Alloys in Shipbuilding. *Metal Industry,* v. 91, Oct. 18, 1957, p. 337-339.

Choice of alloys, fabrication, corrosion resistance, bimetallic corrosion and welding of aluminum superstructures; paper given at Autumn meeting of the Institute of Metals in Glasgow, Scotland. (To be continued.) (T22j, 17-7; Al)

316-T. Double-Duty Dyna. Kim Darby. *Modern Metals,* v. 13, Sept. 1957, p. 37-38.

All-aluminum welded yacht.
(T22g, 17-7, K general, Al)

317-T. All-Welded Aircraft Engine Skid. R. E. Aker. *Modern Metals,* v. 13, Sept. 1957, p. 70-72.

Skid fabricated by metal inert-gas welding from 6061-T6 aluminum alloy. (T24d, 17-7, K1d; Al)

318-T. Aluminum in Mobile Homes. E. A. Farrell. *Modern Metals,* v. 13, Sept. 1957, p. 92-114.

Utilization of aluminum in house trailers estimated to average 350 to 400 lb. each and add to an annual total of 30 to 50 million lb.
(T26n, 17-7; Al)

319-T. Steel Castings in Air Frames. S. K. Hodgson. *Precision Metal Molding,* v. 15, Oct. 1957, p. 37-38.

Use of steel investment castings at Chance Vought Aircraft. Most of the castings are 410 stainless steel at 180,000 psi. min. tensile strength. (T24a, 17-7; SS, 5-12)

320-T. HRT Design Request No. 2 Titanium Components for Alternate Blanket System. R. B. Briggs, J. W. Hill and J. R. McWherter. Oak Ridge National Laboratory. *U. S. Atomic Energy Commission,* CF-54-4-105, Apr. 15, 1954, 11 p. (CMA)

The HRT is a nuclear reactor with heavy water solution core surrounded by a reflector or blanket. Feasibility of titanium components. Titanium has excellent resistance to corrosive attack by uranyly sulphate in the range 250-275° C. while stainless is suitable only below 125° C. 9 ref. (T11k, 17-7; Ti)

321-T. Fabrication of Clad Uranium-Molybdenum Fuel Bearing Rods for Metallurgy Experiments. J. H. Alapatz. Westinghouse Atomic Power Division. *U. S. Atomic Energy Commission,* WAPD-FE-71, Apr. 29, 1954, 13 p. (CMA)

Experimental fabrication of Zircaloy-2 clad U-Mo fuel cores. Extrusion to the final rod is not recommended. Drawing the extruded composite gives more accurate dimensioning to the final rod. Swag-

ing causes a harmful broadening of the fuel-clad interface.
(T11g, 17-7, F27; U, Zr, 8-16)

322-T. Pressure Bonding of Natural Uranium in Zircaloy-2 Hemispherical Cups. B. E. Schame. Westinghouse Atomic Power Division. *U. S. Atomic Energy Commission*, WAPD-FE-77, May 8, 1954, 9 p. (CMA)

Uranium-filled pellets can be produced by pressure bonding uranium cores to prefabricated Zircaloy-2 shells. The maximum amount to which the Zircaloy-2 hemisphere could be filled was only about 70%.
(T11g, K13, 17-7; U, Zr)

323-T. (English, German, French, Spanish.) **Special Steels Used in Machinery for the Iron Mines.** *Aciers Fins & Speciaux Francais*, no. 26, July 1957, p. 36-42.

Chemical compositions and mechanical properties of special steels used in drilling machines, scraper loaders and continuous loaders, shuttle cars and underground locomotives. (T28, 17-7; ST)

324-T. (French.) **Use of Standardized Elements in the Manufacture of Cutting and Punching Tools.** *Machine Moderne*, v. 51, Sept. 1957, p. 1-2.
(T6n, 1)

325-T. (Italian.) **Nickel Catalysts in Hydrocarbon-Steam Reactions.** *Nickel*, no. 69, Aug. 1957, p. 8-14.

Superiority of nickel over other metals in promoting re-forming reactions, especially when nickel is used in conjunction with refractory base; characteristics of refractory bases; effects of composition of refractory, nickel content and temperature on activity of nickel catalysts. (T29, 17-7; Ni, NM-c)

326-T. (Pamphlet.) **Railways and Steel.** 65 p. Steel, Engineering and Housing Section of the Secretariat of the U.N. Economic Commission for Europe. International Documents Service, Columbia University Press, 2960 Broadway, New York 27, N. Y. $.60.

Evolution of production and requirements of steel for European railways; consequences on steel requirements of such developments as electrification, greater traffic speed, shorter turn-round time. Development of railways and the evolution of production of railway materials outside Europe; future export prospects for rails and rolling stock.
(T23, 17-7, A4; ST)

SECTION W

PLANT EQUIPMENT

1-W. How to Control Temperature in Die Casting Dies. V. Die Design for Heat Control. W. M. Halliday. *Precision Metal Molding,* v. 14, Nov. 1956, p. 101 + 6 pages.

Design considerations required for efficient operation. (W19, 18-17)

2-W. Lining of Blast Furnaces With Carbon Brick. A. Send. *Henry Brutcher Translation No.* 3185, 13 p. (From *Stahl und Eisen,* v. 71, no. 25, 1951, p. 1361-1365.) Henry Brutcher, Altadena, Calif.

Previously abstracted from original. See item 59-D, 1952. (W17; NM-h)

3-W. (Czech.) **Materials for Steam Generators and Turbines Operating at High Temperatures and Pressures.** J. Pluhar. *Strojirenstvi,* v. 6, no. 10, Oct. 1956, p. 677-683.

Optimum utilization of low alloy steels, properties of new steels and problems of welding austenitic steel. (W11, K general; AY, 18-2)

4-W. (Dutch.) **Acid Cupola Linings.** A. Bordes. *Metaalinstituut T. N. O.,* no. 40, June 1956, 12 p.

Practical data on raw materials, methods of patching and drying, wear of the lining, consumption of refractory materials, cost. (W18; NM-h)

5-W. (French.) **Practical Advice to Founders.** *Fonderie,* no. 128, Sept. 1956, p. 358-366.

Some practical rules for the correct construction of cast iron or steel flasks for hand finishing. (E19; CI, ST)

6-W. Flexible Batch Furnace Installation in Commercial Heat Treating Plant. Robert Grafmiller. *Industrial Heating,* v. 23, Nov. 1956, p. 2491 + 4 pages.

Economical, flexible installation, furnace operation, quenching control, atmosphere control. (W27)

7-W. Tunnel Annealing Furnace Speeds Stainless Parts Production. P. M. Unterweiser. *Iron Age,* v. 178, Dec. 6, 1956, p. 128-129.

New furnace provides continuous, short cycle for annealing work hardened TV tube housings made of Type 430. It means a reduced scrap rate and can be handled by one operator. (W27; SS)

8-W. A Comparison of Single and Multiple Stack Annealing Furnaces. John Arnold. *Iron and Steel Engineer,* v. 33, Nov. 1956, p. 77-82.

Advantages of single-stack operations include flexibility, lower installation costs, lower product inventory. (W27)

9-W. Intergrated Electro-Mechanical Press Puller Drive System Improves Extrusion Quality. R. C. Suttle. *Iron and Steel Engineer,* v. 33, Nov. 1956, p. 83-88.

Unit features reduced manpower requirements, installation ease, maintenance facility, accurate puller tension, and high-speed electrical response. (W24)

10-W. 16-8-2 Cr-Ni-Mo for Welding Electrode. O. R. Carpenter and R. D. Wylie. *Metal Progress,* v. 70, Nov. 1956, p. 65-73.

Difficulties cropping up with welded stainless equipment in high-temperature service have led to a new composition which is free from weld cracks and is superior to the usual Type 347 electrode in all respects except resistance to intergranular corrosion. (W29; SS, 18-2)

11-W. Metallic Muffle for High-Temperature Sintering. Edmund N. Mazza. *Precision Metal Molding,* v. 14, Dec. 1956, p. 44-45.

Inconel can be successfully and economically used for applications where the maximum temperature does not exceed 1350° C. (W17, 2-12; Ni, 18-2)

12-W. Filler Metals for Joining. Orville T. Barnett. *Welding Engineer,* v. 41, Dec. 1956, p. 54, 56, 59-60.

Advantages of iron powder electrodes include improved deposition rates, high strength, readily controllable slag, good mechanical properties of deposited weld metal, and decreased costs. (W29; Fe, 18-2)

13-W. (Russian.) **Increasing the Durability of Ladles.** N. A. Rokhlin. *Metallurg,* no. 10, Oct. 1956, p. 19-20.

Introduction of heavy lining for teeming ladles, permitting up to 11 melts. (W19; NM-h)

14-W. High Alumina Ladle Linings. V. J. Howard. *Journal of Metals,* v. 8, Dec. 1956, p. 1646-1647.

When handling high-temperature metals, the advantages of high alumina are low shrinkage, high strength, high density and high-temperature resistance. Proper ramming technique and fixing at high temperature before using the ladle are essential. (W19, E23; SG-h, NM-h)

15-W. Zircon Ladle Linings for Cleaner, Low Cost Metal. W. D. Emmett and V. E. Zang. *Journal of Metals,* v. 8, Dec. 1956, p. 1648-1649.

Zircon lining means longer ladle life, considerable savings in cost of lining per ton of metal poured and cleaner metal, but ladles are not easily kept clean of adhering slag and the mix sets up very hard, causing a greater length of time to knock out. (W19, E23; NM-h)

16-W. High-Rake Cutters Triple Life and Speed on High-Tensile Steels. Peter Trippe. *American Machinist,* v. 100, Dec. 31, 1956, p. 81.

Cutter life and speed can be multiplied by three with high-rake cutters, when high-tensile steels are cut, according to British tests. (W25, G17; AY)

17-W. Contamination and Corrosion in Rail Tank Cars. S. John Oechsle, Jr., and Kenneth G. LeFevre. *Corrosion Technology,* v. 3, Dec. 1956, p. 89-92.

Aluminum and stainless steel cars seem to be the ideal solution, but less than 2% of 174,000 tank cars in United States are so constructed because of the initial cost. Recent investigation indicates that protective linings can do the job. (W12, 17-7, R general; Al, SS)

18-W. Axial Blast-Furnace Blower. *Engineer,* v. 202, no. 5262, Nov. 30, 1956, p. 783-784.

The installation supplies air to a furnace for which pressure and quantity of the blast required at present are well below the designed maximum. (W17, D1b)

19-W. All-Gas Furnaces Prove Most Economical for Milwaukee Forge Co. *Industrial Gas,* v. 35, Dec. 1956, p. 10-11.

Savings in metal are effected by using direct gas-fired forge furnaces in the production of weldless rolled rings. (W23)

20-W. Comparison Chart of Gas Welding Rod, Bare Electrodes, Automatic Welding Wires and Metal Spray Wires. *Industry and Welding,* v. 30, Jan. 1957, p. 50-51.

Data for use in selecting proper equipment for various applications. (W29)

21-W. Iron Powder Electrodes Speed Welding by 40 Percent. *Industry and Welding,* v. 30, Jan. 1957, p. 81-82.

Fast, one-pass welding of ⅜-in. fillets made possible by iron powder electrodes. (W29; Fe)

22-W. Handle Press Scrap Fast for Bigger Profits. J. E. Hyler. *Iron Age,* v. 178, Dec. 13, 1956, p. 130-131.

Methods of collection and disposal depended on type and volume of scrap, scrap wanderers, conveyors or magnets used. (W12; AD-b)

23-W. Scrap Bailers: Put Your Money Where it Counts Most. J. E. Hyler. *Iron Age,* v. 178, Dec. 20, 1956, p. 80-82.

Points to consider before the selection of scrap bailer. (W15; RM-p)

24-W. Power Requirements and Selection of Electrical Equipment for Reversing Cold Strip Mills. J. E. Peebles. *Iron and Steel Engineer,* v. 33, no. 12, Dec. 1956, p. 102-120.

Mill stand and reel drive requirements, selection of horsepower, mill stand motor rating, reel motor rating, reel tension vs. motor rating, selection of motors for pull-through mill, rectifiers, control of reel motors, tensiometer control of reel, control of pull-through mill, operator's control stations and motor room layout. (W22; ST, 4-3)

25-W. The Production of Openhearth Steel With Particular Reference to Roof Life. C. D. H. Walker, H. R. Curnick and N. E. Dobbins. *Iron and Steel Institute, Journal,* v. 184, Dec. 1956, p. 410-413.

Instrumentation of openhearth furnace; physical and chemical properties of brick in the furnace; X-ray powder photographs of bricks of each zone. 16 ref. (W18, X9; RM-h)

26-W. Multiple Clamps Insure Accurate Heliarc Welding. George Brolaski and Wells McGregor. *Machinery,* v. 63, Jan. 1957, p. 148-151.

Design and fabrication of fixtures for use with new welding equipment, each fixture being made for a particular job. (W29)

27-W. How Are Your Carbide Tools Performing? Part I. J. F. Allen. *Machinery,* v. 63, no. 5, Jan. 1957, p. 166-172.

Chip breakers and tool wear discussed. (W25, Q23f, 6-19)

28-W. Modern Die Making Machines; Some Recent and Future Possibilities for the Drop-Forging Industry. W. E. Golcher. *Metal Treatment And Drop Forging,* v. 23, Dec. 1956, p. 475-480.

Application of tracer copying mechanisms; die millers with built-in originating features; tape-controlled milling machines; automatic milling by computer control. (W25, W23)

29-W. Annealing With Superfast Cooling Option. Lester E. Alban and Harrold J. Bates. *Steel,* v. 139, Dec. 3, 1956, p. 150-152.

Annealing furnace designed to meet requirements of gear manufacturer handling wide assortment of forgings has superfast cooling zone which can be bypassed if desired. (W27, J23; 4-1)

30-W. Mine Equipment and Machine Tools Fabrication Shops at Sheepbridge Engineering, Ltd. *Welding and Metal Fabrication,* v. 24, no. 12, Dec. 1956, p. 424-430.

Facilities for mass production of mine cars and a great variety of metal forming described. (W14, W25)

31-W. New Fabrication Shop for Positioners. *Welding and Metal Fabrication,* v. 24, no. 12, Dec. 1956, p. 440-441.

Facilities of F. Bode and Son, Ltd., for manufacturing positioners and manipulators for the fabrication industry. (W29)

32-W. "Cascade" Heater Offers Savings in Fuel, Maintenance Costs on Finishing Line. *Western Metals,* v. 14, Dec. 1956, p. 64-65.

Efficiently heats phophate coatings solution. (W3, L14b)

33-W. Simplified Materials Handling Paves Way for Job Shop Conversion to Mass Production. Howard B. Jackson. *Western Metals,* v. 14, Dec. 1956, p. 66-68.

Improved material handling allows production of specialty items as hedge against cut-backs in job orders. (W12)

34-W. (French.) **Equipment for Surface Treatment.** M. Salvaresi. *Metallurgia et la Construction Mecanique,* v. 88, no. 11, Nov. 1956, p. 957-965.

General principles in selection of equipment for surface treatment; dip, spray and manually operated equipment. (W3)

35-W. (Japanese.) **Design of Permanent Magnet Generators.** Kazuyuki Shinoi. *Metals,* v. 26, Dec. 1956, p. 933-937.

Nature of magnets; magnetic adhesion; design of generators. (W11, 17-1; SGA-n)

36-W. Maximum Utilization of Wide-Strip Rolling Equipment. H. H. Ascough and M. I. Meach. *Iron and Steel,* v. 29, Dec. 8, 1956, p. 579-588.

Planning the layout of high-production mills so that the various units maintain a balance of output. (W22, 4-3)

37-W. Rolled Contoured Wing Skins With Finger Tip Controls. Eugene Harp. *Machine and Tool Blue Book,* v. 52, Jan. 1957, p. 137-139.

Standard radial arm router modified so that operator with fingertip controls can adjust the router head to any vertical setting within the limits of the machine. (W24)

38-W. Submerged Arc Welding. *Machinery Lloyd (Overseas Edition),* v. 28, Dec. 8, 1956, p. 83-84.

Automatic equipment (Lincoln Electric Co. Ltd.) consists essentially of a highly responsive d-c. control circuit including an exciter control on the welding generator, a d-c. motor for wire feed and rheostat adjustment of arc voltage, welding current and travel speed. (W29)

39-W. Faster Charge for Open Hearth. *Steel.* v. 139, Dec. 24, 1956, p. 70.

Increased tonnage with new 61-cu. ft. charging boxes. (W18, D2a)

40-W. Huge New Stress-Relieving Furnace Aids Heavy-Duty Fabrication in Bay Area. *Western Machinery and Steel World.* v. 47, Dec. 1956, p. 73.

Furnace is able to accommodate pieces 40 ft. or longer and contains four heat zones. (W27)

41-W. Electrical Equipment for Steel Mill Drives. E. H. Browning. *Blast Furnace and Steel Plant,* v. 45, Jan. 1957, p. 67-71.

Arrangement of d.c. drive motors with magnetic amplifier controls for rod mill, continuous annealing line, and electrolytic tinning line. (W22)

42-W. Position Control of Electrical Screwdown Drives. D. B. Manwaring. *Blast Furnace and Steel Plant,* v. 45, Jan. 1957, p. 72-77.

Reviews limit switch method, potential divider method and synchro method of screwdown controls for rolling mills. 31 ref. (W22)

43-W. Electric Rolling Mill Drives. Jan Soukenik. *Czechoslovak Heavy Industry,* no. 8, 1956, p. 3-15.

History and production program of the Skoda Works electrical engineering factory. Electric motor drives for open rolling mills and continuous rolling mills described. (W23)

44-W. Conveyor Speeds Inspection at New Permanent Mold Foundry. James Joseph. *Foundry,* v. 85, Feb. 1957, p. 146-148.

Conveyor system permits continuous and immediate inspection of aluminum castings. (W12, E12; Al, 5)

45-W. Skin Miller Contours Slabs Automatically. *Iron Age,* v. 179, Jan. 10, 1957, p. 63.

Automatic continuously operating machine with tracer cams makes 120 nonparallel cuts in 5 x 20-ft. aluminum slabs. (W25, G17b; Al, 4-2)

46-W. Rectifiers Bid for More Metalworking Jobs. Arthur Johnson. *Iron Age,* v. 179, Jan. 10, 1957, p. 70-71.

New types of germanium and selenium rectifiers offer compactness, safety, efficiency and flexibility for power units used in steelmaking, arc welding and electroplating. (W11, 17-7; Ge, Se)

47-W. Where Computers Fit in Metalworking. J. J. Obrzut. *Iron Age,* v. 179, Jan. 17, 1957, p. 71-74.

Wide and varied uses for fast accurate calculations in engineering programming, material control and other branches of metalworking. (W14)

48-W. How Plastics Curb Corrosion in Metal Processing. J. H. Lux. *Iron Age,* v. 179, Jan. 17, 1957, p. 80-82.

A number of different plastics have been developed and successfully used for pickling tanks, plating baths, distillation columns, fume ducts, exhaust stacks and numerous other corrosion resistant services. (W general, R general; NM-d)

49-W. Construction and Application of Draft Recorder on a 44-in. Blooming Mill. N. S. Wells, J. Sibakin. *Iron and Steel Engineer,* v. 34, Jan. 1957, p. 103-112.

Design and installation of draft recorder on mills; improvement and standardization of draft practice. (W22; ST)

50-W. Reducing Delays in Blast Furnace Campaigns by Improving Mechanical Features. W. O. Bishop, Charles P. Frame. *Iron and Steel Engineer,* v. 34, Jan. 1957, p. 113-117.

Mechanical and engineering features for improving the life of furnace campaigns. (W17, 17-1)

51-W. High-Strength Turbine Alloy. *Metal Industry,* v. 90, Jan. 1957, p. 3-5.

Studies and requirements in the preparation of a high-strength alloy with high material damping. (W11, 17-7; SGB-a)

52-W. Handling and Packing Forum on Technical Progress. *Steel,* v. 140, Jan. 7, 1957, p. 396-406.

Twenty-four executives briefly comment on recent developments. A few of these are: improvements in steel strapping, new trucks with greater maneuverability, higher lifting speed and work load. Trends toward greater mechanization and automation. (W12, 18-24)

53-W. Kaiser's New Cranes Are Aluminum. *Steel,* v. 140, Jan. 14, 1957, p. 88-89.

Development of new light-weight cranes made possible by easily weldable new aluminum alloy. (W12, 17-7; Al)

54-W. Motor Body Production at Briggs. *Welding and Metal Fabrication,* v. 25, Jan. 1957, p. 9-16.

Mechanical transfer equipment used by car body manufacturer and welding procedure for fenders, side door and under-body assemblies. (W12, K general, T21a)

55-W. New Power Sources for Metal-Arc Gas-Shielded Welding. A. U. Welch. *Welding Journal,* v. 36, Jan. 1957, p. 36-40.

Direct-current rectifier-type welders designed specifically for gas-shielded consumable-electrode arc welding and high current density submerged-arc welding. (W29, K1d)

56-W. Tape Controlled Riveting Machine Increases Production 400 Per Cent. *Western Machinery and Steel World,* v. 48, Jan. 1957, p. 73.

Produces fuel-sealed wing segments automatically. (W1, K13n)

57-W. (German.) **The Manufacture of Graphite Electrodes for Electric Steel Furnaces.** Alfred Ragoss. *Archiv für das Eisenhüttenwesen,* v. 27, Nov. 1956, p. 681-688.

Molten carbon possible only at very high temperatures under high pressure; manufacture of graphite electrodes from granulated carbon with binder. For high conductivity use of petroleum and pitch cokes necessary. Description of procedures. 10 ref. (W18; NM-K36)

58-W. (German.) **Galvanizing Furnaces With Forced Waste Gas Rotation Heating. (Part 2.)** J. Kohlgrueber. *Draht,* v. 7, December 1956, p. 468-472.

Illustrations and detailed descriptions are given of an iron wire galvanizing installation, a thin plate-galvanizing installation, and a galvanizing furnace with oil-waste gas rotation heating. (W3, L16; ST, *Zn*)

59-W. (German.) **Bell-Type Furnaces for Annealing Sheets in an Upright Position in a Protective Gas Atmosphere.** Ernst Labouvie. *Stahl und Eisen,* v. 76, Dec. 27, 1956, p. 1741-1744.

Preliminary tests for a new type of annealing furnace. Design of the furnace for annealing in a vertical position. Test results. Behavior of the sheets in their further processing. (W27, J23; 4-3)

60-W. Nickel-Chromium Alloy Extends Life of Salt Pot. *Automotive Industries,* v. 116, Jan. 1, 1957, p. 67.

Inconel pot users report long service life. (W28, 17-7; Ni, *Cr*, SGA-h)

61-W. Metal Rectifiers for Electroplating. D. J. Fishlock. *The Electrical Journal,* v. 158, Jan. 4, 1957, p. 26-29.

Selenium rectifiers; transformers, constant current density controllers, anodizing controllers, power supplies and water-cooling equipment for rectifiers. 2 ref. (To be continued.) (W3)

62-W. Gas and the Non-Ferrous Metal Industry. G. le B. Diamond. *Metal Industry,* v. 90, Jan. 1957, p. 43-45.

Recent furnace conversions to gas as a solution to fuel problem in England, including installations for brass melting, aluminum alloy melting, stereotype metal melting and associated equipment.
(W18, RM-m, Cu-n, Al)

63-W. Metal Polishing With Set-Up Wheels. R. S. Burt. *Metal Finishing,* v. 55, Feb. 1957, p. 52-55.

Types of adhesives, abrasion materials, preparation of wheel for set-up and paste heading of polishing wheels. (W2, L10b; NM-j)

64-W. (Dutch.) **Foundry Melting Furnaces for Nonferrous Metals. (Part I.)** H. Boswinkel. *Metalen,* v. 12, Jan. 1957, p. 2-6.

A review of various types of furnaces and of criteria for selection to meet practical requirements. (To be continued.) (W19; EG-a)

65-W. (French.) **Refractory Lining of Crucible Furnaces.** *Fonderie,* no. 131, Dec. 1956, p. 513-515.

Suggests that ordinary siliceous linings for crucible furnaces, and silicon carbide where very high temperatures are required, are preferable to the use of silicon-aluminum bricks. (W19; RM-h 36)

66-W. (French.) **Descriptive Sketch of a Rotary Hearth Furnace for the Heat Treatment of Plough Moldboards.** *Metallurgie et la Construction Mecanique,* Dec. 1956, p. 1037-1038.

Stresses the superiority of the rotary hearth furnace in the manufacture of plough moldboards. Describes structure and operation of furnace. (W27)

67-W. (German.) **Assessment of Various Furnace Linings.** Edgar Spetzler. *Stahl und Eisen,* v. 76, Dec. 27, 1956, p. 1734-1740.

Consumption of chrome ore-magnesite bricks in openhearth steel plants. Grouping of furnace linings by types of bricks. Comparative assessment of various brick linings. Cost of brick for furnace repairs. Oxygen requirements dependent on type of lining. Efficiency of the furnace. Furnace output and heat consumption. Metallurgical work and conditions of operation. 2 ref. (W18, D2g; RM-h)

68-W. Spalling Tests on Blast Furnace Brick. K. A. Baab. *American Ceramic Society, Bulletin,* v. 36, Jan. 1957, p. 14-17.

Standard tests for predicting spalling behavior during initial heating and for determining maximum heating rate for various sizes of blast furnace brick. Results of a modified panel spalling test.
(W17; RM-h)

69-W. Russia's Conveyorized Machine-Tool Production. Peter Trippe. *American Machinist,* v. 101, Feb. 11, 1957, p. 146-150.

Processes in Russian factory's producing lathe and radial drilling machines. (W25, 18-24)

70-W. Metallurgical Considerations of Main Steam Piping for High-Temperature, High-Pressure Service. H. S. Blumberg. *Blast Furnace and Steel Plant,* v. 45, Feb. 1957, p. 220-224; disc., p. 250-251.

Requirements for base piping metal and weldments. Service history of various steel used in piping for steam plants. 10 ref. (W10, 17-7; ST)

71-W. Light Gage Steel Connection With High-Strength High-Torqued Bolts. George Winter. *International Association for Bridge and Structural Engineers, Publications,* v. 16, 1956, p. 513-528.

It is shown that fewer high-strength bolts are required, connection slip can be eliminated by using these bolts, and that a lower factor of safety is warranted than when using ordinary bolts .(W1, 17-7; ST)

72-W. How to Avoid Problems With Damp Electrodes. A. C. Ward. *Iron Age,* v. 179, Feb. 7, 1957, p. 108-110.

Lime or titania coatings on stainless electrodes readily absorb moisture causing porosity in weld. Suggestions for detecting and correcting dampness. (W29; SS)

73-W. Resistance-Heat Titanium for Brake-Forming. *Iron Age,* v. 179, Feb. 14, 1957, p. 130. (CMA)

Two innovations have been added to the conventional setup for brake-forming: a controlled resistance heater of 50 kva. capacity, and a holding fixture with quick-acting clamps and power leads only at one end. Both are portable. A ceramic coat electrically insulates the die surfaces and back gages. (W20, G1; Ti)

74-W. Electric Arc Furnaces: Use in Steel Foundries and Bulk Steel Production. F. S. Leigh. *Iron and Coal Trades Review,* v. 174, Jan. 11, 1957, p. 83-90.

Advances in the design and construction of arc furnaces. (W18)

75-W. Russian Survey. Part Six. Conveyorized Production of Machine Tools. Peter Trippe. *Metalworking Production,* v. 101, Jan. 18, 1957, p. 91-112.

Processes in Russian factories producing lathes and radial drilling machines. (W25, W12, 18-24)

76-W. Russian Survey, Part Seven. Peter Trippe. *Metalworking Production,* v. 101, Jan. 25, 1957, p. 135-152.

Automation meets the demand for special machines for new lines by spreading orders around the industry. (W25, 18-24)

77-W. Russian Survey, Part Eight. Peter Trippe. *Metalworking Production,* v. 101, Feb. 1, 1957, p. 179-184.

Every machine tool plant builds specials in parallel with its production of standard types and this is also true in the production of grinding machines. (W25)

78-W. Nitride-Bonded Silicon Carbide. W. L. Wroten. *Product Engineering,* v. 28, Feb. 1957, p. 135-139.

Use of nitride-bonded silicon carbide in centrifugal pump for transferring molten aluminum. (W13, 17-7; Si, 6-19, Al)

79-W. Oxygen Through the Roof. *Steel,* v. 140, Feb. 11, 1957, p. 112-116.

A water-cooled oxygen probe is positioned through the specially constructed roof of openhearth. The apparatus and its advantages. (W18, D2g)

80-W. Horizontal Furnace Heats Extrusions. A. F. Snow. *Steel,* v. 140, Feb. 18, 1957, p. 155-156.

Furnace designed for heat treating aluminum extrusions up to 100 ft. in length has shorter heating time, less material handling and gives improved properties with less distortion than vertical furnaces previously used. (W27; Al, 4-8)

81-W. (French.) **Induction Furnaces for Firing and Smelting Reviewed.** J. Minissieux. *Revue Geneale de l'Electicite,* v. 65, Nov. 1956, p. 623-632.

Survey of the various types of induction furnaces, recent modifications in techniques, various new fields of application and extension of use in the development of new products .(W18, C21d, D6)

82-W. (French.) **Survey of Water in Steelmaking.** Pierre Mosel. *Revue Technique Luxembougeoise.* No. 4, Oct.-Dec. 1956, p. 208-210.

Uses and importance of adequate water supply in steelmaking with special reference to the needs and extent of consumption of iron and steel industries in Luxembourg during 1955. (W10; ST)

83-W. (French and German.) **Aluminum in Atomic Industry.** Jürg Staehelin. *Aluminium Suisse,* v. 7. Jan. 1957, p. 23-28.

Indicated that the low radioactivity of aluminum permits its use in the construction of atomic reactors and remote-controlled devices for manipulating radioactive substances; notes also the utilization of aluminum in the separation of uranium-238 from uranium-235 by diffusion and in protective coatings against radioactive liquids and dust. (W11, 17-7, C6b; Al, U)

84-W. Yesterday, Today, Tomorrow—Pipeline Steels. *American Society of Mechanical Engineers,* Preprint 56-A-97, Nov. 1956, 19 p.

History of line pipe manufacture; welding characteristics; research in progress; transportation of coal in pipeline. (W10, 17-7; ST)

85-W. Bibliography on Pressure Die Casting Equipment. G. L. Cooper. *British Atomic Energy Research Establishment,* A.E.R.E. INF/BIB 108, Oct. 1956, 9 p.

References covering the period 1945-1955, organized as follows: (1) general references, (2) machines, (3) dies. (W19, E13)

86-W. Roof Performance in the Third Campaign of an All-Basic Openhearth Furnace. G. R. Rigby and H. M. Richardson. *British Ceramic Society, Transactions,* v. 56, Jan. 1957, p. 22-36.

Examination in the laboratory of (a) samples of the unused magnesite-chrome bricks, (b) a 4-in. thick peel from the working-face of the roof after 633 heats, and (c) bricks taken at the end of the campaign. Chemical, X-ray and petrological examinations all revealed that iron oxide, lime and silica had been absorbed at the hot face and had migrated into brick. Factors contributing to the long life of this roof are tentatively suggested. (W18; RM-h)

87-W. Convection Stoving Ovens. W. G. J. Appleton. *Electroplating and Metal Finishing,* v. 10, Feb. 1957, p. 36-40.

Radiant and convection systems of stoving each have their own particular merits and limitations. Surveys various types of convection stoving systems with the advantages and disadvantages of each, illustrated with examples from practice. Comparisons with radiant heating processes made. (W3)

88-W. Steel Castings Shrug Off Wear and Impact Abuse. C. G. Mickelson. *Iron Age,* v. 179, Feb. 21, 1957, p. 100-101.

Wearpact, a low-alloy steel, shows unusual tensile and impact strength with high wear resistance. Field tests indicate usefulness as dipper points on mine shovels and crusher linings. (W14, Q9n, Q6n, Q27a; AY-b, 5)

89-W. Air Conveyors Breeze Through Tough Handling Chores. E. J. Egan, Jr. *Iron Age,* v. 179, Feb. 14, 1957, p. 115-118.

Air conveyors of the bulk type unload and move materials while carrier-type conveyors deliver paper work, small tools and parts. (W12)

90-W. High-Nickel Electrode Welds Most Dissimilar Metals. *Iron Age,* v. 179, Feb. 14, 1957, p. 122-123.

Test data for welds between mild and stainless steel or other dissimilar metals indicate welds made with standard arc welding processes and high nickel electrodes have desirable mechanical property. Electrodes eliminate some cracking and buckling problems. (W29; Ni)

91-W. Protection of Refractories by Moving Air Curtains. J. H. Chesters, C. Holden and A. D. Robertson. *Iron and Steel Institute, Journal,* v. 185, Feb. 1957, p. 177-200.

Starting from the conception of a furnace in which the air enters at the opposite end to the fuel to form a sheet separating the flux-laden combustion gases from the refractories, the simpler idea of a moving air curtain directed from the backwall skewbacks over the underside of the roof has been developed. Studies made both in the laboratory and on actual openhearth furnaces show that what at first appeared to be a very simple idea is, in fact, quite complex, a moving air curtain entraining substantial quantities of furnace gases and being penetrated surprisingly easily by both coarse droplets and fine fume. 6 ref. (W18)

92-W. Dip Brazing With Paste Filler. Donald E. Wernz and Mel M. Schwartz. *Materials and Methods,* v. 45, Feb. 1957, p. 118-120.

New aluminum paste filler is replacing conventional sheet and wire brazing preforms in some dip brazed assemblies. Preforming time is eliminated, fillets are smoother and stronger and gaps may be larger. (W29, K8)

93-W. Magnesium Tooling Plate Proves Its Merits as Tooling Ma-

terial. *Modern Industrial Press,* v. 19, Feb. 1957, p. 36-38.

Combination of light weight, machinability, stability and cost make magnesium tooling plate especially well suited for tooling applications such as stretch form dies and filler snakes. (W24, W25, 17-7; Mg)

94-W. Filler Metals for Joining. Orville T. Barnett. *Welding Engineer,* v. 42, Feb. 1957, p. 38-40.

Composition, tensile strength and ductility of deposited metal from high-tensile, low-alloy steel electrodes and the applications of these electrodes. (W29, Q27a, Q23p; 7-1)

95-W. (English.) **Special Steels for the Manufacture of Boiler Tubes.** *Aciers Fins et Spéciaux Francais,* no. 24, Dec. 1956, p. 55-61.

Mechanical and chemical properties sought in high-grade boiler steels in addition to good ductility at working temperatures; principal grades of steels used in France for boiler construction. Favors austenitic steels derived from the typical 18-8 type. (W11, 17-7, Q general; SS-e)

96-W. (French.) **The Martin Furnace, Terni System.** A. Rossin. *Institut de Recherches de la Siderurgie (IRSID) Publications, Series A.,* no. 127, Dec. 1956, p. 193-203.

Details of the construction and results of the use of an improved type of Martin furnace. (W18)

97-W. (French.) **Light Metal Pipelines for Oil Fields.** André Chevrier. *Revue de l'Aluminium,* no. 239, Jan. 1957, p. 82-83.

Owing to the good behavior of aluminum in the presence of crude oil, even containing sulphur, it has been possible to design pipe systems with no extra thickness to cope with corrosion. Light weight, ease of handling and transportation, and the flexibility of the couplings of such pipes reduce laying and recovery expenses to a considerable measure. (W14, 17-7; Al)

98-W. Materials Problems in Nuclear Reactors. C. O. Smith. *American Society of Naval Engineers, Journal,* v. 69, Feb. 1957, p. 37-44.

General requirements of reactor materials, process of fission, components of a reaction, requirements for submarines. (W11, 17-7)

99-W. Refractories in the Foundry. J. H. Cannon and A. L. Bradley. *Engineer and Foundrymen,* v. 21, Jan. 1957, p. 60-65.

The failure of refractory materials, physical aspects of cupola lining life, and types of linings. (W19; RM-h)

100-W. Refractories in Cupola Practice. J. R. Park. *Foundry Trade Journal,* v. 102, Feb. 7, 1957, p. 165-167.

Desired properties of lining materials, technical and practical aspects of repair and maintenance of linings. (W18, RM-8)

101-W. Steelworks' Lubrication Practice: British Engineers Study German Methods. H. Peter Jost. *Iron and Coal Trades Review,* v. 174, Feb. 1, 1957, p. 275-276, 280.

German lubrication systems: single line system, closed fabric bearings, slipper and palm end lubrication and specifications for lubricants. (W10, 18-23)

102-W. A New Look in Milling Cutters. Joseph R. Varnak. *Machinery,* v. 63, March 1957, p. 151-156.

Increases in cutting speeds have been realized by increased rake angles. Average cutter life between grinds was greater for high-rake tools, also a better finish and smaller burrs resulted, and most satisfactory coolant was found to be soluble oil type for high-rake tools. (W25, 17-7; NM-h)

103-W. Metallurgical Progress and the Steam Engineer. L. Sanderson. *Steam Engineer,* v. 26, Feb. 1957, p. 147-149.

An annual review of developments in metallurgy and materials for steam engineers. (W11, 17-7)

104-W. (French and German.) **The Blow Torch Used for Heating in Industry.** Jacques Delambre. *Zeitschrift für Schweisstechnik,* no. 2, Feb. 1957, p. 37-45.

Construction and mode of operation of several types of welding torches; extension of the use of the blow torch to various aspects of metalworking, such as forging and forming, has necessitated changes in design allowing for multiple nozzles, quick change-over from propane to acetylene and easy regulation of the flame. (To be continued.) (W29)

105-W. (German.) **Construction Principles for Crane Bridges.** Karl Eckinger. *Stahl und Eisen,* v. 77, Jan. 10, 1957, p. 15-23.

Torsional tests on American high-web crane girders to check the

validity of Bredt's formula. Stress measurements on crane girders of the classic type. The tubular girder. Model tests on box girders. Different framework designs.
(W12, 17-7, Q1, 1-4; ST)

106-W. (German.) **Torsion-Proof Box Girders in the Construction of Mill Cranes.** Heinz Schwarz. *Stahl und Eisen,* v. 77, Jan. 10, 1957, p. 24-32.

Changing over from the framework girder to the box-type girder. Design problems in the construction of heavy cranes. Crane construction and welding technique. The application of the box girder and its simplified maintenance.
(W12, 17-7, 17-1; ST)

107-W. (German.) **Contribution to the Standardization of Mill Crane Gears.** Albrecht Wolf. *Stahl und Eisen,* v. 77, Jan. 10, 1957, p. 33-36.

Bordering standard and design standard. Establishment of standard distances between axles as a base for gear standardization. Possibilities and critical evaluation of a standard series for axle distances. Loading of gear steps and dimensions of cases and gear sets.
(W12, 17-7, T7; ST)

108-W. (German.) **Present State of Development of Waste Heat Boilers and Cooling Plants for Openhearth Furnaces.** Werner Schemman. *Stahl und Eisen,* v. 77, Jan. 24, 1957, p. 78-84.

Various types of boilers and of furnace door cooling frames. Other furnace cooling elements. References to further development and standardization. 3 ref. (W10, W18)

109-W. (German.) **Practical Experiences and Damages Encountered With Waste Heat Boilers and Cooling Plants for Openhearth Furnaces.** Werner Heil. *Stahl und Eisen,* v. 77, Jan. 24, 1957, p. 84-91.

Influence of cleaning methods on design of La Mont boilers installed at openhearth furnaces. Blowing-off with compressed air or steam, jolting, rinsing with water and cleaning with a shower of balls. Various breakdown causes. 3 ref.
(W10, 18-21)

110-W. (German.) **Method of Cleaning the Waste Heat Boiler Installed at an Openhearth Furnace.** Paul Jacobi. *Stahl und Eisen,* v. 77, Jan. 24, 1957, p. 91-95.

Operational experience in cleaning a waste heat boiler. Wet cleaning and cleaning with a shower of balls. Simultaneous use of the two cleaning methods. Wear of boiler parts.
(W10, 18-21)

111-W. (German.) **Economic and Technical Results of the Operation of Waste Heat Boilers and Cooling Plants Installed at Openhearth Furnaces.** Max Zur. *Stahl und Eisen,* v. 77, Jan. 24, 1957, p. 95-100.

Design of the openhearth steel plant. Layout of the waste heat boiler and cooling plant. Quantity and heat consumption per ton of steel produced. Economic aspects and initial cost of the waste heat and cooling plants.
(W10, 18-17, 17-3)

112-W. (German.) **Statistical Analysis of Breakdowns in Electrical Plant Equipment of Steel Mills.** Volkmar Steinecke. *Stahl und Eisen,* v. 77, Jan. 24, 1957, p. 100-103.

Importance of recording and analyzing breakdowns in the electrical equipment. Mathematical statistical analysis as a means to evaluate the susceptibility to breakdowns. Breakdown statistics and operational experiences. 8 ref. (W11, 18-21)

113-W. (Swedish.) **Planning of Foundry Ventilation.** Karl Nilsson. *Gjuteriet,* v. 12, Dec. 1956, p. 161-163.

Ventilation with regard to the building and the production methods in the foundry. Importance of simultaneous planning.
(W10, E general)

114-W. (Report.) **Tentative Specification for Brazing Filler Metal.** *American Society for Testing Materials,* **ASTM B 260-56T, AWS A5-8-56T, 1956,** 11 p.

The 29 classifications included in this edition cover every type of brazing filler metal in common use today. The new revision provides details on chemical compositions of the filler metals, standard sizes and lengths, packaging and marking.
(W27; SGA-f, 15-18)

115-W. (Book—German.) **Rolling Mill Furnaces and Additional Plant Facilities.** Friedrich Karl Reintsch. 91 p. 1956. Fachbuchverlag, Leipzig, Germany.

A survey. Topics covered are heating and reheating furnaces, preheating, firing methods, fuels, materials and construction of rolling mill furnaces, control and measuring devices. Literature and source bibliography. (W20)

116-W. Modernized Plant Adopts Mechanized Heat Treating. Francis A. O'Brien. *American Machinist,* v. 101, Mar. 11, 1957, p. 146-147.

Snap-hearth furnace with controlled atmosphere and washer-dryer combination can carbo-nitride and clean to control case depth of 300 lb. of screws per hr.
(W27, 18-24, J28m; ST)

117-W. Electric Power Systems for Steel Plants. H. N. Cox and L. G. Levoy. *Applications and Steel Industry, (A.I.E.E. Transactions),* no. 28, Jan. 1957, p. 339-348.

Progress in electric systems and components in steelmaking industry; electric energy generation and consumption, general requirements of steel mill power systems. (W11; ST)

118-W. Compressed Air Essentials in Steel Plant Operations. *Blast Furnace and Steel Plant,* v. 45, Mar. 1957, p. 326-328 and 344.

Includes uses of compressor selection and installation, distribution systems, operation and maintenance.
(W13; ST)

119-W. Titanium Condenser Tubes. *Engineering and Boiler House Review,* v. 72, Mar. 1957, p. 75-76. (CMA)

The first titanium condenser tubes ever used in a British power station are undergoing service at Uskmouth Power Station (South Wales), located on the Usk estuary. The tubes are solid-drawn from ICI Titanium 130. The ICI nomenclature is described. Titanium has excellent corrosion resistance to sea water.
(W11, 17-7, R4b; Ti)

120-W. Let Magnets Clean Up Rolling Mill Coolants. A. L. Wilson, Jr. *Iron Age,* v. 179, Mar. 7, 1957, p. 132-133.

Drum-type magnetic separators effectively remove magnetic contaminants and oil waste from dirty cold rolling mill coolants, greatly prolonging interval between tank clean-outs.
(W23; NM-h)

121-W. Fuel and Power Balance in Ironworks; Influence of New Trends in Ironmaking. J. Szceniowski. *Iron and Coal Trades Review,* v. 174, Feb. 15, 1957, p. 385-388.

Iron and steelworks using a high propertion of molten iron have been considered as excessive producers of gas and power. The construction of "common-houses" made it possible to utilize the gas surplus more profitaably from the viewpoint of heat balance of blast furnace.
(W17, D1; Fe)

122-W. Forging Furnaces in Sweden. A. Roslund and E. Tholander. *Metal Treatment and Drop Forging,* v. 24, Feb. 1957, p. 47-53.

Oil heated and electric furnaces for forgings discussed with reference to furnace design, atmosphere and temperature control, mechanization of handling, and relative economies with relation to fuel supply in Sweden. (W20; RM-k30, 16-11)

123-W. Drop-Forging Dies and Tools. M. J. Husson. *Metal Treatment and Drop Forging,* v. 24, Feb. 1957, p. 61-64, 68.

Considerations in design and treatment of dies for both old and new drop hammers. Operations in production of forgings. Die-block materials and die manufacture as practiced in France. (W22, 17-7, 17-1)

124-W. A Comparative Study of Thoriated, Zirconiated and Pure Tungsten Electrodes. L. P. Winsor and R. R. Turk. *Welding Journal,* v. 36, Mar. 1957, p. 113s-119s.

Comparison was made under both normal and abnormal welding conditions using direct current and alternating current arcs in atmospheres of argon and helium. Thoriated-tungsten electrodes showed superior starting performance during d-c straight polarity welding of stainless steel, followed by zirconiated tungsten and pure tungsten in that order. 4 ref.
(W29, 17-7; SS, W)

125-W. (German.) **The Hand Scraper in the Foundry.** W. Gesell and W. Riege. *Giesserei,* v. 44, Feb. 14, 1957, p. 107-110.

Various types of scrapers. Possible uses. Special combinations with other loading or handling means.
(W19, W12)

126-W. (German.) **Investigation on the Behavior of Feeders, Williams Type, as Down-Gates for Steel Castings.** Heinz-Ulrich Doliwa. *Giesserei,* v. 44, Feb. 28, 1957, p. 129-133.

Principles of the feeding technique; advantages and disadvantages of Williams feeders; conditions for the combination of Williams feeders and open gates at atmospheric pressure. (W19, E22p; ST, 5)

127-W. (German.) **New Cast Iron Materials for Rolls. Their Characteristics and Possibilities of Application.** Hel-

mut Goebel. *Stahl und Eisen,* v. 77, Feb. 7, 1957, p. 143-157.

Importance of the modern developments in rolling methods; requirements to be met by the materials used for rolls. Cast iron with spheroidal graphite as compared with chilled cast iron; mechanical properties of the materials. (W23, Q general; CI, 17-7)

128-W. (Italian.) **Metallurgical Problems of Nuclear Reactors.** F. Giordani. *Metallurgia Italiana,* v. 49, Jan. 1957, p. 1-13.

Fusion, fission, lixiviation, sintering, etc., of uranium, thorium, plutonium; methods of obtaining enriched nuclear fuels; treatment of exhausted nuclear fuels; heterogeneous thermal reactors; problems of temperature and corrosion; radiation; etc. (W11, 17-7; U, Th, Pu)

129-W. Dry Hearth Melting for Aluminum. F. L. Turk. *Canadian Metals,* v. 20, Mar. 1957, p. 24.

Sloping hearth furnace used by blower manufacturer has faster melting rate, continuous feed to holding bath and constant holding temperature. (W18; Al)

130-W. Carbon-Dioxide Process of Mould and Core Production. G. E. Parramore. *Foundry Trade Journal,* v. 102, Mar. 1957, p. 325-331.

Development, equipment, gassing technique, preparation and storing of sand and binder in mold and core production using carbon dioxide to harden sodium silicate binder in sand. Discusses variety of mold and castings, demonstrating versatility, merits and limitations of method. (To be continued.) (W19; NM-f45)

131-W. New 60-Cycle Aluminum Billet Heater for Continuous Extrusion Process. D. G. Hatchard, P. G. Simpson and L. B. Kimbrough. *Industrial Heating,* v. 24, Feb. 1957, p. 295-302.

Heat control operation and advantages of induction heater. (W20, F24, 1-11; Al)

132-W. Carbon Arc Image Furnace. T. P. Davis. *Industrial Heating,* v. 24, Mar. 1957, p. 496-504.

Three systems for gathering and concentrating irradiance; methods for controlling and measuring radiant energy; advantages and limitations of heating methods. (W27)

133-W. All-Basic Open Hearth Furnace. R. P. Heuer and M. A. Fay. *Iron and Steel Engineer,* v. 34, Feb. 1957, p. 95-118.

Development of all-basic furnaces in America and Europe, construction and operation. Productivity and cost compared to furnaces with silica main roofs. 137 ref. (W18; RM-h38)

134-W. Electrical Equipment for Continuous Annealing of Silicon Steel Strip. G. J. Hay and H. S. Fegely. *Iron and Steel Engineer,* v. 34, Mar. 1957, p. 78-85.

An all-magnetic amplifier regulating system (with the exception of loop control) is in successful operation on a major processing line; the design enables factory assembly and adjustment in the factory prior to startup and provides increased reliability and reduced maintenance. (W27, X10, J23, 1-11; ST, *Si,* 4-3)

135-W. Stone Pit Lining Experience at Ford. William J. Scharfenaker. *Iron and Steel Engineer,* v. 34, Mar. 1957, p. 98-104.

Application of sandstone pit lining and its advantages and disadvantages. Stone has its place in soaking pits but it must be used with judgment; considerable care is required in construction and operation, particularly on pits with long walls. (W20; RM-h)

136-W. Cooperative Trials on All-Basic Furnace Roofs. B.I.S.R.A. and British Ceramic Research Association. *Iron and Steel Institute Journal,* v. 185, Mar. 1957, p. 304-328.

All-basic openhearth roof trials at four steel plants are described. Seven of the eleven trials were panel roofs of either Detrick or Continental suspension. The panel roofs were built with either four or five transverse panels of two or three brick brands so that at least two brands of bricks of different chemical and physical properties could be compared under the same conditions in one roof. (W18; RM-h)

137-W. Graphite Electrode Consumption in Electric Arc Furnaces. T. A. Cosh. *Iron and Steel Institute Journal,* v. 185, Mar. 1957, p. 328-332.

Data relating to electrode consumption in production-type electric-arc furnaces have been subjected to statistical analysis. From an analysis of these data indications are given of the extent to which electrode length, diameter, and surface area influence electrode con-

sumption. The effect of electrode diameter on electrical consumption has also been analyzed. (W18, S12)

138-W. Templeborough Melting Shop Reconstruction Scheme. F. Moore. *Iron and Steel Institute Journal,* v. 185, Mar. 1957, p. 333-342.

Fourteen openhearth furnaces of 80 tons capacity were each converted to 100 tons capacity. This involved a complete change of the structures and equipment needed for casting. The ways in which the changes were made to minimize production losses are described. (W18, 18-19, D2)

139-W. Use of Oxygen at Abbey Melting Shop, Steel Co. of Wales, Ltd. A. J. Kesterton. *Journal of Metals,* v. 9, Feb. 1957, p. 274-280.

Description of a water-cooled probe, introduced through the roof of an openhearth furnace for jetting oxygen into steel. Effects on carbon elimination and other operating data. A system of slag control for sulphur elimination, involving control of oxygen utilization, lime addition and bath carbon. (W18, D2g)

140-W. Nonferrous Research Uses Solar Furnace. W. M. Tuddenham. *Journal of Metals,* v. 9, Mar. 1957, p. 346-348.

Description of solar energy furnace built at Kennecott utilizing 60-in. searchlight reflector and heliostat. (W13, 16-13)

141-W. (German.) **Special Machine for the Milling of Light Metal Bars.** A. Pfeifer. *Aluminium,* v. 33, Mar. 1957, p. 164-170.

Nearly automatic machine for the milling of rolled bars and detecting cracks. Description of individual parts (connecting track, loading station, chucking and milling station, testing and unloading station). Processing of a pure aluminum bar (60 x 33½ x 9") in 2 min. (20 metric tons of bars per hr.). (W25; Al)

142-W. (German.) **Progress in the Development of Welding Rods Coated With Titanium Oxide.** Camille De Rop. *Stahl und Eisen,* v. 77, Feb. 21, 1957, p. 215-218. (CMA)

The rod described is thickly covered with a mixture of metal oxides containing up to 50% titanium dioxide, mostly as rutile. During the welding operation a fluid but easily solidifying slag is formed, permitting welding speeds up to 50 cm. per min. in horizontal work. The resulting weld is metallurgically pure and of satisfactory mechanical properties, even at high welding speeds. 9 ref. (W29, K1)

143-W. (Italian.) **Liquid Parting Agents for Forms.** Rinaldo Cattaneo. *Fonderie,* v. 6, Jan. 1957, p. 27-28.

Disadvantages of classic parting agents. Liquid agents can be used for as many as 15 to 20 castings per application. Characteristics of good liquid agents; method of use. (W19)

144-W. (Italian.) **Contribution to the Study of Behavior of Silica Bricks in Electric Furnace Vaults.** E. Biagiotti and G. Grungo. *Metallurgia Italiana,* v. 49, Jan. 1957, p. 35-43.

Examination of "nontransformed" and "transformed" types of bricks in zones of several vaults of the same electric furnace used under possibly different conditions. Importance of microscopic study underlined. (W18; RM-h 36)

145-W. (Book.) **Commercial and International Developments in Atomic Energy.** 598 p. 1956. Atomic Industrial Forum, Inc. 260 Madison Ave., New York 16, N. Y. $8.50.

Review of metallurgical literature; power, test, and research reactors; fuels and source materials; reactor safety; radiation and radio-isotope applications and facilities; marketing, sales, and investments in atomic energy; atomic activities outside the U.S.; and a review of Geneva Papers. (W11, T11)

146-W. Applications of the Shaker-Hearth Furnace. Heat Treatment on a Quantity Production. *Australasian Manufacturer,* v. 41, Feb. 9, 1957, p. 43-45, 57.

Shaker-hearth furnaces have virtually eliminated the problems hitherto inherent in the heat treatment of small parts in large quantities. Since the design was introduced, between 80 and 90 units have been installed. With standard hearth widths from 6 to 24 in., the furnaces are proving suitable for hardening, and in some instances tempering and austempering, a wide range of small carbon steel components. (W27)

147-W. Liquid Metals and Nuclear Power. C. D. Boadle. *Atomics and Nuclear Energy,* v. 8, Mar. 1957, p. 83-85, 106.

Use of liquid metals as a means of high-temperature heat extraction from nuclear reactors. Liquid metals have particular advantages as a heat transfer medium over other substances, but their disadvantages are that they require, amongst other

things, a complex primary cooling circuit. (W11, 17-7; 14-10)

148-W. Complete Mechanization of Heat Treating—a Growing Trend. O. E. Cullen. *Flow,* Jan. 1957, p. 55-58.

Mechanized heat treating equipment is effectively pointing the way to automation in the heat treat shop; processes and equipment are described. (W27, 18-24)

149-W. Titanium Sponge Handling System. J. Grindrod. *Mining Journal,* v. 248, Mar. 15, 1957, p. 336. (CMA)

A system of bulk handling of titanium sponge was developed by Tote Systems, Inc., for Rem-Cru. Hermetically sealed aluminum bins are employed for the transport and storage of sponge. The use of 60 bins has resulted in a saving of $25,000. (W12; Ti, 6-24)

150-W. Production Machines for Coated Abrasives. *Precision Metal Molding,* v. 15, Mar. 1957, p. 68-71.

Survey of some of the newer machines, both portable and stationary, that have been developed to use coated abrasives. (W25, NM-j)

151-W. (French.) **New Results of Tests on Ingot Molds.** G. Bauer, J. Duflot and A. Gibeau. *Fonderie,* no. 133, Feb. 1957, p. 64-79.

Design, preparation and use of ingot molds; analysis of the relationship between the weight of the ingot mold and the weight of the ingot. 6 ref. (W19, 17-1)

152-W. (French.) **Electrochemistry and Electrometallurgy at the Service of Atomic Energy.** *Journal du Four Eléctrique,* no. 6, Nov-Dec. 1956, p. 195-197.

Atomic reactors; use of heavy metals (uranium, thorium), light metals such as cadmium and magnesium, metalloids (graphite) in the construction of nuclear piles; shows the close interdependence between the electrochemical and electrometallurgical industries and atomic industry. (W11, 17-7, 1)

153-W. (French.) **Continuous Furnaces for the Annealing of Tubes.** *Pratique des Industries Mécaniques,* v. 40, Jan. 1957, p. 24-26.

Types of continuous furnaces; construction and mode of operation; fuels employed. (W27, 1-11, J23; 4-10)

154-W. (French and German.) **Use of the Heating Torch in Industry.** Jacques Delambre. *Journal de la Soudure,* v. 47, no. 3, Mar. 1957, p. 75-81.

Uses in stamping, forming and forging operations. (W29, F21b)

155-W. (German.) **Steel for High-Pressure Die-Casting Dies and Molds.** H. Hiller. *Giesserei,* v. 44, Mar. 14, 1957, p. 141-149.

General remarks on hot working toolsteels; effect of the alloying elements; thermal shock stress of the die steels; steels for high-pressure die-casting dies and molds; susceptibility of the die steels to hot cracking; degree of deformation and orientation of the structure; forging of single dies; heat treatment; nitriding; strength of the die steels in service. (W19, 17-7, E13; TS-k)

156-W. (German.) **Modern Special Furnaces for the Continuous Annealing of Strip Brass.** F. Deutz and R. Jansen. *Metall,* v. 11, Feb. 1957, p. 120-123.

Determining factor for the choice between gas or electrically heated furnaces is the price of gas or electricity. Description of two roller furnaces, one with gas revolution and cooling by water shower, the other with direct gas heating and cooling by means of a protective gas. (W27, J23, 1-11; Cu-n, 4-3)

157-W. (Italian.) **Modernization of a Continuous Rod Mill.** Baldo Nozza. *Atti Notizie* (Monthly Bulletin of Italian Metallurgical Assoc.), Incorporated in *Metallurgia Italiana,* v. 11, Dec. 1956, p. 413-416.

Postwar changes and addition to Unione Works of Falck Co., Milan, made gradually (and still incomplete) without extended interruption of production. (W23, 18-20)

158-W. (Russian.) **Machine for the Fast Charging of Martin Furnaces.** A. V. Kolesnikov. *Vestnik Mashinostroeniia,* v. 37, no. 1, Jan. 1957, p. 19-22.

Description of machine requiring neither remodeling of the furnace nor installation of new carriage facilities in plants with crane charging; prevention of significant heat loss during charging of scrap, ore, limestone, etc. 4 ref. (W18, W12)

159-W. (Russian.) **Blast-Furnace Slag Bucket With New Type of Ribbing.** K. A. Pak. *Vestnik Mashinostroeniia,* v. 37, no. 1, Jan. 1957, p. 23-25.

Effects of temperature, fracture and deformation near the bearing races upon strength of the slag bucket. New methods of ribbing to combat deformation. (W12, W17)

160-W. Heat and Pressure Resistant Alloys for Gas Turbines and Nuclear Reactors as Power Plants. M. S. Thacker. *Indian Institute of Metals, Transactions,* v. 8, 1954-55, p. 37-59.

Composition of high-temperature alloys, special requirements of nuclear power plants, neutron adsorption capacity, special metals and cermets. (W11, 17-7; SGA-h)

161-W. Some Experiments on the Substitution of Low-Carbon Ferromanganese in Flux of Coated Arc Welding Electrodes by High-Manganese Core Wire. D. R. Dhanbhoora, S. Visvanathan and S. N. Anant Narayan. *Indian Institute of Metals, Transactions,* v. 8, 1954-55, p. 301-308.

Low-carbon ferromanganese is a standard constituent in electrode fluxes. Use of high-manganese core wires in place of the standard rods. The development of a suitable flux coating for such rods is traced. 7 ref. (W29; Mn, RM-q)

162-W. Titanium Work Holders Speed Anodizing Process. G. C. Close. *Light Metal Age,* v. 15, Feb. 1957, p. 37. (CMA)

A titanium-tipped aluminum rack for chromic acid anodizing was designed for the Torrance plant of Douglas Aircraft. Time and money are saved. A trial run of all-titanium racks in the chromic acid electrolyte gave poor results; much current was lost to the solution. Racks with titanium work holders riveted in place behaved similarly. (W3, 17-7; Ti)

163-W. Production of Air Cleaner Shells on a Transfer Press. W. N. Hanna. *Machinery,* v. 90, Mar. 22, 1957, p. 637-640.

Description of press and transfer equipment used in successive blanking, drawing, piercing, and trimming operations in production of base for air cleaner from steel strip. (W24)

164-W. (German.) **Applicability of the Short Rotary Furnace in Nonferrous Metallurgy.** Edwin Neubert. *Neue Hütte,* v. 1, Jan. 1957, p. 39-43.

Melting tests; intermediate product treatment; transfer of know-how gained from small-scale experiments to short rotary furnace design; commercial considerations. (W18; EG-a)

165-W. (Italian.) **In-Plant Transport in the Steel Industry.** Nicola Marangoni. *Fonderia,* v. 6, Feb. 1957, p. 71-79.

Methods used at Soc. Nazionale Cogne (Aosta, Italy) and flow of material in production of low and alloy steels. (W10, D general; AY)

166-W. Zirconium as a Reactor Material. F. R. Paulsen. *Atomics,* v. 8, no. 4, Apr. 1957, p. 121-123. (CMA)

Occurrence, extraction and purification of zirconium. Aside from its value as a corrosion resistant material in the chemical process industries, zirconium has great value as a material in nuclear reactors because of its core life and neutron economy. The use of zirconium for cans in the moderator of the Nautilus is described; getters in the form of alloying additions were necessary to keep oxygen contamination from liquid sodium low. Mechanical properties and corrosion resistance are adversely affected by intense radiation which disturbs the crystal lattice. A modified heliarc method makes possible butt welds 10 ft. long. (W11, 17-7, 2-17; Zr)

167-W. Thread Grinding Wheel Selection. D. H. Curry. *Automatic Machining,* v. 18, Apr. 1957, p. 54-58.

Conditions affecting selection of grain and bond for grinding wheels were type and pitch of thread, material, production rate, finish, equipment, dressing practice and grinding fluid. (W25)

168-W. ISCOR's Manufacture of Welding Wire. Processes From the Ore to the Finished Wire. M. Eaton. *Engineer and Foundryman,* v. 21, Mar. 1957, p. 50-55.

Iron ore used at Pretoria is a dense hematite, low in phosphorus and free from sulphur; method of refining the ore and the mechanical properties of the wire produced. (W29, 17-7, D general, Q general; ST)

169-W. Rating System Simplifies Welding Electrode Selection. O. T. Barnett. *Iron Age,* v. 179, Apr. 4, 1957, p. 91-96.

Rating factors on deposition rate, penetration, ductility, soundness, freedom from splatter, weld positions and classifications of nine commonly used mild steel electrodes. (W29, 15; CN)

170-W. Forged Steel Cogging-Mill Rolls. Prevention of Breakage. M. Massin. *Iron and Coal Trades Review,* v. 174, Apr. 12, 1957, p. 863-865.

Forged and cast steel rolls compared and roll compositions evaluated. (W23, 17-7; ST, 4-1, 5)

171-W. How to Select the Proper Heat Treating Equipment. Carl F.

Burling. *Metal Treating,* v. 8, Mar-Apr. 1957, p. 2-4, 21, 29, 38 and 39.

Emphasizes consideration of plant conditions and requirements; types of furnaces available. (W27)

172-W. Uranium's Future in the Energy Field. Chauncey Starr. *Mining Congress Journal,* v. 43, Apr. 1957, p. 118-120.

The physical process of atomic power generation, the "workings" of different types of reactors. Focuses attention on developments that will lead to the rapid growth in uranium requirements. (W11, 17-7; U)

173-W. Everlasting Anodizing Racks. K. Darby. *Modern Metals,* v. 13, Apr. 1957, p. 78, 80, 82. (CMA)

Evidence supports titanium as the optimum material for anodizing racks, but specifically designed titanium racks are prohibitive in cost. A universal titanium rack has been designed by Robé Inc., Springfield, Va., which has as a basic element a T-slot channel. Several variations are described: the Bi-Var (two channels spot-welded back to back), the Tri-Var (three channels), the Multi-Var and the Verti-Var. Commercial titanium is the material used since alloys do not carry enough current and are less acid resistant.
(W3, 17-7; Ti)

174-W. Welding Electrode Selector. *Steel,* v. 140, Apr. 1, 1957, p. 98 + 6 p.

Tables giving trade names and ASTM-AWS specification numbers of electrodes of mild steel, low-alloy steel, stainless, automatic wire, aluminum, magnesium and copper.
(W29, 17-7, 15-18; CN, AY, SS, Al, Mg, Cu)

175-W. New Developments in the Welding of Heavy-Gage Steel Plate. M. M. Fishkis. *Henry Brutcher Translation* no. 3774, 5 p. (From *Avtomaticheskaya Svarka,* v. 8, no. 5, 1955, p. 74-77.) Henry Brutcher, Altadena, Calif.

Description of a new high-efficiency coil semi-automatic welding gun; examples of its use for welding press crossheads, refacing worn parts and repairing defects in steel castings. (W29)

176-W. Use of High-Alumina Brick in Hot-Blast Stoves. A. I. Kulik, et al. *Henry Brutcher Translation* no. 3867, 4 p. (From *Stal',* v. 16, no. 7, 1956, p. 582-585.) Henry Brutcher, Altadena, Calif.

Plant-scale trials on performance of high-alumina brick, fired and green, respectively, in domes and upper checker courses of hot-blast stoves of blast furnaces on basic iron and on ferromanganese.
(W17; Fe, RM-h)

177-W. (French.) **English Built Foundry Machinery.** *Metallurgie et la Construction Mecanique,* v. 89, Mar. 1957, p. 233-234.

Molding machines; furnaces and cupolas; sand equipment.
(W19, W18)

178-W. (French.) **Evolution of the Technology of Industrial Furnaces.** J. G. Robin. *Metallurgie et la Construction Mecanique,* v. 89, Mar. 1957, p. 253-255.

Development of mechanization; special furnaces, construction details, water cooling, gaseous atmospheres; recent installations in France and Europe. (W27, W18)

179-W. (French.) **Material Handling Apparatus in the Iron and Steel Industry.** *Metallurgie et la Construction Mecanique,* v. 89, Mar. 1957, p. 259-263.

Equipment used in crushing and agglomerating; surveys coke plants, blast furnaces, steelworks and rolling mills. (W12; ST)

180-W. (French and German.) **Standardized Aluminum Sections for the Construction of Air Ducts.** Hans Badertscher. *Aluminium Suisse,* v. 7, Mar. 1957, p. 71-72.

Details of assembly using seven standardized aluminum joints; applications include use in equipment for air conditioning and heating in humid or acidic atmospheres; advantages over rigid sections.
(W10, 17-7; Al)

181-W. (German.) **Pneumatic Lifting Apparatus Used in the Foundry.** W. Gesell and W. Riege. *Giesserei,* v. 44, Mar. 28, 1957, p. 179-182.

Peculiarities of the electric hoist and of pneumatic lifting apparatus; range of application; layout for cost accounting. (W12, E general)

182-W. (German.) **Automation of Cupola Furnace Charging.** H. Gluge. *Giesserei-Praxis,* v. 75, Feb. 10, 1957, p. 57-59.

Installation and advantages of automatic overhead hoisting mechanisms. (W18, W12, 18-24)

183-W. (German.) **Electric Resistance Heating for the Processing of Steel.** Wilhelm Stich. *Stahl und Eisen,* v. 77, Apr. 4, 1957, p. 394-408.

Mode of action and design of the heating apparatus; heating process and scaling; current consumption and economy. Quality of the surface, grain size and dissolution of the structure of heat treated steel. (W27, J general)

184-W. (German.) **Volklingen-Type Cross-Flow Shaft Kiln for Burning Small Lump Limestone.** Werner Heiligenstaedt. *Stahl und Eisen,* v. 77, Apr. 4, 1957, p. 421-426.

Selection of a new lime burning kiln; its firing and flow principles; description of the kiln as built; operational results; experience with a basic converter steel plant using lime in small lumps; improved design resulting from the knowledge gained from trial operation. (W13; NM-e)

185-W. (German.) **Crucible Induction Furnace for Nonferrous Heavy Metal Alloys.** Dieter Hartman and Heinz Rohn. *Zeitschrift für Metallkunde,* v. 48, Mar. 1957, p. 85-90.

Development of an 800-kg. capacity, 50-cps. furnace for copper-rich alloys; its efficiency is compared with a ring-shaped induction furnace. 6 ref. (W18; Cu)

186-W. (German.) **Crucible Furnaces.** Hans H. Pistor. *Zeitschrift für Metallkunde,* v. 48, Mar. 1957, p. 101-103.

A survey of crucible furnaces (except induction furnaces) for light and heavy metals. Gas and oil-fired furnaces permit adjustment for a slightly reducing atmosphere. Regulation of temperature is possible for each mode of heating. (W18; RM-k, RM-m)

187-W. (Italian.) **Rotary and Spirek Furnaces in Mercury Metallurgy.** Agostino Busachi. *Industria Mineraria,* v. 8, Jan. 1957, p. 15-16.

Recent initial installation of rotary furnaces (Gould) in Italy leads author to consider relative merits of two above types as regards production, operating costs, health factors. (W18; Hg)

188-W. (Italian.) **Abrasive Tools and Factors Determining Their Efficiency.** Gualtiero Pizzetti. *Rivista di Meccanica,* no. 151, Dec. 15, 1956, p. 9-15.

Rigid and flexible types; uses; wet working; characteristics and properties of abrasive raw materials. 9 ref. (W25; NM-j)

189-W. (Book—German.) **Handbook of Technical Electro Chemistry, v. 4, Pt. 3A. Electric Furnaces.** Georg Eger, ed. 323 p. 1956. Akademische Verlagsgesellschaft Geeste & Porting K. G. Sternwartenstrasse 8, Leipzig, C 1, Germany. DM 36.

Compliation of articles on the use of electrical furnaces for copper, nickel, cobalt, lead, zinc, aluminum and manganese. (W18, C21d; Cu, Ni, Co, Pb, Zn, Al, Mn)

190-W. Powdered Graphite Molds Simplify Titanium Casting. A. L. Feild and R. E. Edelman. *Modern Castings,* v. 31, May 1957, p. 64-68. (CMA)

Complex titanium shapes can be cast in a graphite powder mixture which can be formed into a mold or core with conventional equipment; the cost is much less than with machined graphite molds. The results of a titanium casting study at Battelle, using approved furnace techniques, are reported. The optimum composition was 53% graphite powder, 10% cornstarch, 10% pulverized pitch, 8% carbonaceous cement, 1% surfactant and 18% water. The starch furnishes green strength and the pitch and cement form a solid, high-temperature bond when the mold is fired. Casting a valve body is discussed as an example. No reaction of the casting with the mold was revealed. Further reduction in the amount of water used is desirable. (W19g, 1-2; Ti, NM-k 36)

191-W. Vacuum Arc Melting Furnace for Refractory Metals. O. Z. Rylski and H. V. Kinsey. Paper from "Arcs in Inert Atmospheres and Vacuum", Electrochemical Society. (John Wiley & Sons, Inc.), p. 69-76.

Permits use of consumable or nonconsumable electrode. Adaptable for either low-pressure melting with continuous evacuation of gases, or melting in argon with pressures up to or slightly higher than one atmosphere. (W18s, 1-23, 1-2)

192-W. A Pilot-Model, Three-Phase, A.C. Consumable-Electrode Furnace. P. C. Magnusson, G. L. Schmidt, F. Caputo and R. A. Beall. Paper from "Arcs in Inert Atmospheres and Vacuum", Electrochemical Society. (John Wiley & Sons, Inc.), p. 77-86.

Yields a billet-shaped ingot suitable for direct rolling. The three electrodes are placed in line and power supply connected in wye. (W18s, 1-2)

193-W. Electrode Control Systems for Inert Atmosphere and Vacuum Arc Furnaces. E. J. Borrebach. Paper from "Arcs in Inert Atmospheres and

Vacuum", Electrochemical Society. (John Wiley & Sons, Inc.), p. 87-96.

Operating characteristics and relative merits of electronic, electromechanical, rotary regulator and magnetic amplifier controls.
(W18s, X10, 1-2, 1-23)

194-W. The High Intensity Arc: Electrode Requirements for Metallurgical Application. Samuel Korman and Charles Sheer. Paper from "Arcs in Inert Atmospheres and Vacuum", Electrochemical Society. (John Wiley & Sons, Inc.), p. 184-188.

Problems in electrode fabrication as regards ore-carbon ratio. 1 ref.
(W18s, T1f, 17-7)

195-W. Chemical Aspects of Nuclear Power. I—Chemistry and Metallurgy. F. S. Martin. *Atomics and Nuclear Energy,* v. 8, Apr. 1957, p. 127-130, 147.

In the program of nuclear power, joint collaboration between chemists and metallurgists has been vitally necessary for the design of components and study of the behavior of materials. Some of these important aspects are dealt with.
(W11p, 17-7)

196-W. Modern Hot Blast Stove Charging Equipment. Herman Jansen. *British Steelmaker,* v. 23, Apr. 1957, p. 104-109.

Illustrates arrangement and describes operation of burner shutoff valves, hot blast valves, pressure relief valves, chimney valves and equipment for central control of blast furnace stoves.
(W17g, X12b, 1-2; Fe)

197-W. Fume Exhaustion in the Plating and Allied Industries. D. J. Fishlock. *Electroplating and Metal Finishing,* v. 10, Apr. 1957, p. 103-108.

Different types of exhaust equipment for fume-evolving finishing processes. (To be continued.)
(W13c, L17, 1-2)

198-W. Vertical Casting Wheel Now in Full Production at Utah Copper Refinery. *Engineering and Mining Journal,* v. 158, Apr. 1957, p. 75-77.

Brief descriptions of design features of vertical casting wheel which permits automatic casting of cakes up to 3200 lb. in weight.
(W19f, 1-2; Cu)

199-W. Blast Furnaces in Czechoslovakia. Construction of Thin-Walled Furnaces. S. Chernov. *Iron and Coal Trades Review,* v. 174, Mar. 29, 1957, p. 741-743. (Summary of a Russian article in *Stal'*).

About half the blast furnaces in use in Czechoslovakia are of thin-walled construction, with a brickwork lining of a thickness of 150 to 250 min. (6 to 10 in.). Experience with such furnaces has shown that they are suitable for the smelting of various grades of iron, and in long-term reconstruction plans it is proposed to replace most of the present blast furnaces in Czechoslovakia by thin-walled units.
(W17g, 1-2; Fe, RM-h)

200-W. (German.) **Anodes for Chromium Baths.** Günter Dehmel. *Metallwaren-Industrie und Galvanotechnik,* v. 48, Apr. 1957, p. 153-156, 164.

Lead alloyed with antimony, silver, or a specially developed alloy "Chromin", results in the most satisfactory anodes. 8 ref.
(W3h, 17-7; Pb, *Sb, Ag, Cr*)

201-W. Design Features of High-Frequency Hardening Machines. Karl Belling and Hans-Karl Sehler. *AEG Progress,* no. 3, 1956, p. 205-210.

By the use of induction hardening machines surface hardening may be carried out with an assurance of the best possible results as regards quality and performance. Principles are indicated, which are applicable to the design of machines for their particular function. Correct operation is insured by automatic features and electrical regulating devices. Typical examples of machines for various purposes.
(W27k, 1-2)

202-W. Iron Powder Improves the Weld Complexion. Reid Ellenor. *Canadian Machinery and Manufacturing News,* v. 68, Apr. 1957, p. 173-178.

Rules for selecting electrodes; advantages of iron powder electrodes.
(W29h, 17-7; Fe)

203-W. Use of Liquid Metals in Atomic Reactors. J. B. Lewis. *Discovery,* v. 17, Nov. 1956, p. 469-472.

Problems of sodium-graphite reactor; Dounreay fast breeder reactor; and liquid metal fueled reactor. (W11p, 17-7; 14-10)

204-W. New Semi-Continuous Hot-Strip Mill in Belgium. *Iron and Coal Trades Review,* v. 174, Mar. 22, 1957, p. 673-674, 672.

Short survey of mills in Belgium; description of a new strip mill.
(W23c, 1-2, 1-11)

205-W. Today's Challenge of Nuclear Corrosion. Robert F. Koenig.

Power, v. 101, Apr. 1957, p. 80, 81, 180, 182, 184.

Selection of corrosion-resistant metals for pressurized-water reactors. (W11p, 17-7, R general)

206-W. Production of Corrosion Resistant Steel Castings for the Uranium Industry. W. G. Boustred. *South African Mechanical Engineer,* v. 6, Jan. 1957, p. 199-205.

Types of alloys manufactured, nature of castings manufactured, melting techniques, heat treatment and machining of the castings. (W11p, 17-7, SGA-g, 5)

207-W. (French.) **Aligned Point Nomograms for Calculations Dealing With Electrolytic Aluminum Furnaces.** Louis Ferrand. *Revue Générale de l'Electricité,* v. 66, Feb. 1957, p. 111-123.

Operating and structural parameters of these furnaces, particularly those pertaining to dimensions of anodes and of the crucible surrounding the latter. (W18e, 1-2; Al)

208-W. (German.) **Lances With Explosive Charge (Jet Tappers for Opening the Tapholes of Openhearth Furnaces) Pt. I. Design and Mode of Action of the Shooting Lance.** Josef Prior. *Stahl und Eisen,* v. 77, May 2, 1957, p. 562-563.

Description of the model received from the U.S.A.; mode of action of the hollow charge and of the copper insert; effect of the hollow charge in opening the tapholes of openhearth furnaces. (W18r, 1-22, D9n; ST)

209-W. (German.) **Opening the Tapholes of Openhearth Furnaces by Means of Lances with Explosive Charge (Jet Tappers) Pt. II.** Werner Burmeister. *Stahl und Eisen,* v. 77, May 2, 1957, p. 563-567.

Description of the parts of the lance and operation of the second melter; introduction of the lance into the pouring spout after preboring. Technical advantages of the new method; increased speed, safety and economy; cost problem; effect of the size of the furnace on the economic efficiency of the new method. (W18r, 1-22, D9n; ST)

210-W. (German.) **Design and Performance of Hydraulic Descaling Units in Rolling Mills.** Wolfgang Berns. *Stahl und Eisen,* v. 77, May 2, 1957, p. 567-576.

Design of descaling units in a Steckel mill, a continuous rolling mill for medium strip and a heavy plate rolling mill; number and sites of the jets; measurement and control of the hydraulic equipment; dimensions and operation of nozzles; electric current and water consumption. (W23, 1-22, L10g)

211-W. (Italian.) **Studies and Research on Heat Resistant Alloys and Their Use in Gas Turbines.** Federico Bragoni. *Calore,* v. 28, Feb. 1957, p. 55-70.

Problems of selection of materials for gas turbines. Work done in Europe, Great Britain and U.S. in development of these steels; composition and characteristics, with special reference to Sirius, Virgo and Nimonic steels. 19 ref. (W11m, 17-7; SGA-h)

212-W. (Italian.) **Automatic Control of Blast-Furnace Gas Cleaning Plant With Four Blowers.** R. Porlezza and M. Valussi. *Metallurgia Italiana,* v. 49, Apr. 1957, p. 290-294.

Hydraulic control equipment distributes the load uniformly among four gas blowers. (W17n, 1-2)

213-W. (Swedish.) **Core Material for the Cores of Steel Plant Ingot Molds.** J. Brickner. *Gjuteriet,* v. 47, Feb. 1957, p. 23-24.

Core material bound with cellulose derivative gives total separation of the core from the ingot after only a few minutes. (W19c, 17-7; ST)

214-W. (Book.) **Arcs in Inert Atmospheres and Vacuum.** Edited by W. E. Kuhn, 188 p. 1956. John Wiley & Sons, Inc., 440 Fourth Ave., New York 16, N. Y. $7.50.

Papers presented at the Symposium on Arcs in Inert Atmospheres and Vacuum of the Electrothermics and Metallurgy Division of the Electrochemical Society, Apr. 30 and May 1, 1956, at San Francisco, Calif. Covers inert atmospheres and vacuum furnaces, arc properties, effects of magnetic stirring, electrode requirements, melting rates of copper, iron, titanium, molybdenum, high intensity arcs. Papers separately abstracted. (W18)

215-W. (Book—German.) **Construction and Operation of Cupola Furnaces. Vol. 1.** Leopold Schmid. 163 p. 1956. VEB Wilhelm Knapp Verlag, Mühweg 19, Halle (Saale), C2, Germany. DM 11.

Topics discussed include: development of smelting technique, construction of furnace and auxiliary equipment. Bibliography. (W18d)

216-W. (Book—German.) **Construction and Operation of Cupola Furnaces. Vol. 2.** Leopold Schmid. 219 p. 1953. VEB Wilhelm Knapp Verlag, Mühlweg 19, Halle (Saale), Germany. DM 9.60.

Raw materials, fuels, furnace agents, chemical and physical processes in the stack, measurement and composition of iron ingredients. Bibliography. (W18d, E10; Fe)

217-W. In-Wall Temperature During Blow-In. A. T. Sadler. *Blast Furnace and Steel Plant,* v. 45, Apr. 1957, p. 48-52.

Rate of temperature rise of new linings in blast furnaces followed by means of thermocouples placed in wall during relining. Data on furnace dimensions and wind rate. (W17g, X9q, 1-2; RM-h)

218-W. Venturi Washers. L. W. Butz. *Blast Furnace and Steel Plant,* v. 45, Apr. 1957, p. 398-399.

Operational advantages from installation of Venturi gas washers in blast furnace at Bethlehem Steel plant. (W17n, 1-2)

219-W. Metal Vacuum Furnace for the Melting of Metals by Radio Frequency Heating. F. Roberts and B. T. Bell. *Combustion Boiler House and Nuclear Review,* v. 11, Apr. 1957, p. 169-172.

Water-cooled metal vacuum furnace for the vacuum melting of metals such as copper, steel and uranium using a high voltage valve oscillator as the power supply; furnace design and operation. (W18a, 1-2, 1-23)

220-W. Electric Salt-Bath Furnaces. Greater Efficiency Than Conventional Furnaces. *Corrosion Technology,* v. 4, Apr. 1957, p. 118-119.

Use and development of electric salt bath furnaces, their construction and applications. (W27m, 1-2, 1-18)

221-W. Melting Facilities Get Priority. *Foundry Trade Journal,* v. 102, Apr. 11, 1957, p. 439-446.

Describes cupola charging conveyor system with weighing buckets and induction melting furnace of 5-ton capacity, 50-cycle type. Installations at International Combustion Ltd. (W18d, W18a, W12b, 1-2)

222-W. Nuclear Technology and the Steel Industry. R. P. Petersen. *Iron and Steel Engineer,* v. 34, Apr. 1957, p. 124-128.

Brief review of significance of atomic energy. Estimate of atomic power costs; assuming successful technology, nuclear power ought to be 10¢ per million Btu. (W11p, 1-2; ST)

223-W. Metallurgical Problems of Atomic Energy. L. Rotherham. *Journal of the Institute of Metals,* v. 85, May 1957, p. 393-396.

Problems arising in connection with structures, fuels and special metal requirements. Reference to analogous problems in other industries. (W11p, 17-7)

224-W. Extrusion Press Tooling. Pt. 1. Frank Sowa. *Light Metal Age,* v. 15, Apr. 1957, p. 37-39.

Discusses billet container of extrusion press, materials for construction and types with 1, 2 or 3-piece construction. (To be continued.) (W24g, F24, 1-2, 17-7)

225-W. Development of Rolling Mill Design for Aluminium. *Light Metals,* v. 20, Apr. 1957, p. 118-119.

Developments during past 27 years in design of rolling mills for light metals by W. H. A. Robertson and Co. (W23, 1-2, 17-1; Al)

226-W. Automated Line at Pontiac for Stem Pinion Machining. Herbert Chase. *Machine and Tool Blue Book,* v. 52, Apr. 1957, p. 116-120.

Milling centering machines and five lathes with loading and transfer equipment perform all turning, facing and chamfering operations automatically on stem pinion of SAE 4620 steel. (W25n, W25r, 1-2, 18-24; AY)

227-W. Developments at the Works of Beans Industries. *Machinery,* v. 90, Apr. 26, 1957, p. 919-922.

Conveyor system mechanizes handling in core and molding sections of foundry. (W12r, 1-2, E general)

228-W. Almco Supersheen Barrel-Finishing Process. *Machinery,* v. 90, Apr. 26, 1957, p. 923-926.

Barrel finishing machines and their use for cleaning and polishing stainless, aluminum and other metal parts; loading arrangements and fixtures for holding components during barreling; submerged barrel finishing machines. (W2s, 1-2; SS, Al)

229-W. Automatic Material-Handling for the Die-Caster. E. N. Field. *Machinery,* v. 63, May 1957, p. 179-185.

Systems and devices for the automatic removal and transfer of

castings from casting, forming or trimming dies. (W12, 1-2, E13)

230-W. New Flame-Cutting Machines in Shipbuilding. Richard Bechtle. *Welding and Metal Fabrication,* v. 25, Apr. 1957, p. 125-130.

Design of metal-cutting machines used in European shipyards with note on template for adjusting cutting jets and types of guide rails; arrangements for continuous cutting and control of machines.
(W29d, G22g, 1-2)

231-W. How to Select Proper Regulators. Pt. 2. A. F. Chouinard. *Welding Engineer,* v. 42, May 1957, p. 34-36.

Operating characteristics of gas cylinder pressure regulators, advantages of pressure compensating nozzle-type regulator for most types of gas used in welding, except carbon dioxide. (W29c, W29e, 1-2)

232-W. Filler Metals for Joining. Orville T. Barnett. *Welding Engineer,* v. 42, May 1957, p. 64-70.

Considers the nature of cast iron and problems arising in joining it by brazing or welding; filler rods for electrodes with cast iron bases, copper bases, nickel bases and steel filler metals; typical analysis, welding procedure used, special advantages and applications.
(W29h, 1-2; CI, Cu, Ni, ST)

233-W. New Concept for Control of Resistance-Welding Machines. W. J. Farrell and J. L. Solomon. *Welding Journal,* v. 36, Apr. 1957, p. 356-362.

New concept of direct counting of cycles of line frequency, and impulses of secondary current, rather than previous indirect method of timing, provides control medium of absolute accuracy permitting unlimited function duration.
(W29c, K3, 1-2)

234-W. Fabricating the Vallecitos Atomic Reactor. J. D. Harrell. *Western Machinery and Steel World,* v. 48, Apr. 1957, p. 106-110.

Welding and inspection techniques used in fabrication of vessel 7 ft. in diam. and 22 ft. high from 3⅜-in. stainless clad mild steel.
(W11p, 17-7, K general, S general; CN, SS, 8-16)

235-W. On the Use of Dolomite Brick in Openhearth and Electric Arc Furnaces. F. Gareis. *Henry Brutcher Translation* No. 3354, 3 p. (From *Stahl und Eisen,* v. 72, no. 7, 1952, p. 345-347.) Henry Brutcher, Altadena, Calif.

Difficulties encountered when first using dolomite brick in openhearth furnace because of contraction and infiltration; results of trials made to study performance of improved dolomite brick in bulkheads, piers, roofs and flues of openhearth furnaces; behavior of improved dolomite brick in walls, bottoms, arches and piers of arc furnaces.
(W18r, W18s, 17-7, RM-h)

236-W. Ways of Extending the Life of Blast Furnaces. S. I. Shkumatov. *Henry Brutcher Translation* No. 3868, 4 p. (From *Stal',* v. 16, no. 3, 1956, p. 200-203.) Henry Brutcher, Altadena, Calif.

Various refractory materials used in blast-furnace hearth bottom, hearth walls, bosh zone and shaft, and performance in the course of 12 years of operation; advantages of use of larger quantities of basic refractories and carbon blocks in furnaces operating on a basic slag. Lining materials, thicknesses, recommended for a blast furnace.
(W17g, 1-2; ST, RM-h)

237-W. Ramming of Runners From Blast Furnace With a Carbonaceous Composition. M. K. Vasil'ev. *Henry Brutcher Translation* No. 3901, 1 p. (From *Metallurg,* v. 1, no. 1, 1956, p. 20.) Henry Brutcher, Altadena, Calif.

Lining of iron and slag runners from blast furnaces with a carbon material (instead of foundry sand, etc.). Particulars on composition and preparation of the carbonaceous ramming mass; performance of the carbon linings in actual service.
(W17g, 1-2, RM-h)

238-W. (French.) **Small Capacity Furnaces for Heat Treatments.** J. G. Robin. *Metallurgie et la Construction Mecanique,* v. 89, May 1957, p. 467-471.

Multiplicity of treatments necessitated by engineering requirements; characteristics of furnaces built for this treatment; vertical furnaces; horizontal furnaces; quenching vats; oil refrigeration; temperature.
(W27, 1-2)

239-W. (French and German.) **Rational Handling of Heavy Nonferrous Metal Scrap.** W. Affolter. *Pro-Metal,* v. 10, Apr. 1957, p. 799-805.

Methods and equipment newly introduced in metallurgical plants with special reference to the use of pallet boxes as containers for the easy transport and storage of all types of scrap.
(W12c, 1-2; EG-a, RM-p)

240-W. (German.) **Green Sand Molds for Large Steel Castings.** Charles W. Briggs. *Giesserei,* v. 44, Apr. 25, 1957, p. 238-245.

Characteristics of new facing sand; reconditioned, reclaimed sand as facing sand; handling and storing of sand; the molding process; skin drying and mold washes; cores for large green sand molds; advantages and difficulties of green sand molding of large steel castings.
(W19g, 1-2; NM-f45, ST)

241-W. (German.) **Economic Transport in the Foundry by Means of Lifting and Stacking Trucks.** Fr. Fink. *Giesserei,* v. 44, Apr. 25, 1957, p. 263-266.

Examples of rationalization of transportation in charging furnaces: preparation of sand, stocking in the melting shop, conveying pattern and mold boxes, and transport of finished castings. (W12, 1-2, E general)

242-W. (German.) **Novel Core Molding Machine.** Erwinn Knipp. *Giesserei,* v. 44, Apr. 25, 1957, p. 267-268.

Manufacture of cores from sand, oil sand and cement sand; description of core molding machine.
(W19g, 1-2; NM-f45)

243-W. (German.) **Transport and Handling of the Materials Charged Into the Blast Furnaces in the United Kingdom.** Howard R. Mills and John H. Turnbull. *Stahl und Eisen,* v. 77, Apr. 18, 1957, p. 457-469.

Influence of the difference in supply of domestic and imported ores on the transportation and handling problems. Transport and handling of coal and coke; coal handling and treating within the works, transport and blending of the coal and feeding into the coke-ovens.
(W12, 1-2, D1; RM-j, RM-n, Fe)

244-W. (German.) **Fundamental Trend of Development in the Construction of Cars for German Iron and Steel Works.** Friedrich Brill. *Stahl und Eisen,* v. 77, Apr. 18, 1957, p. 469-476.

Significance of the transportation task within the sidings of iron and steel works. Box-type and self-discharging cars; door operating gear of the self-discharging cars.
(W12n, 1-2; ST)

245-W. (German.) **Induction Melting Furnaces.** Aldo Cella and Karl-Heinz Brokmeier. *Zeitschrift für Metallkunde,* v. 48, Apr. 1957, p. 201-205.

The operating principles of seven important induction melting furnaces described to point out that the net frequency induction furnace with crucible is a most versatile and adjustable instrument under many working conditions. 8 ref.
(W18a, 1-2)

246-W. Experience With a Coreless, Mains Frequency, Melting Furnace. T. R. Twigger. *British Foundryman,* v. 50, Jan. 1957, p. 32-38.

Description of coreless induction melting furnace for 60-cycle per sec. current with maximum charge of 1800 lb.; experiences with installation in a British iron foundry in melting cast irons. 6 ref.
(W18a, 1-2; CI)

247-W. Cupola Developments. *British Foundryman,* v. 50, Mar. 1957, p. 110-127.

Types of hot blast plants operating in the United Kingdom with operating details for nine plants. Effect of hot blast temperature, composition and tapping temperature; coke performance with heated blast; effect of oxygen on melting rate, tapping temperature and composition of melt; economics of oxygen enrichment. 10 ref.
(W18d, E10a, 1-2)

248-W. Experiences in Operating a Wet Spark Arrester on a Cupola. M. M. Hallett and T. Shaw. *British Foundryman,* v. 50, Mar. 1957, p. 128-131.

Spark arrester is mounted on a cupola of 36-in. melting zone diam. and consists of an expansion chamber containing a water-cooled central baffle. Operating procedure, cost data. (W18d, 1-2)

249-W. Dehumidification of the Cupola Blast. F. W. Jacobs. *Foundry,* v. 85, May 1957, p. 174-177.

An 80-ton dehumidifier at Texas Foundries, Inc. consisting of two compressor units cools air to 41° F. where it is capable of holding 3 grains of moisture per cu. ft. Savings in coke and other material result. (W13f, E10a, 1-2)

250-W. Radioactive Gage Aids Cupola Stock-Line Control. H. A. Tuttle, G. E. Noakes and T. Roy Thomas. *Foundry,* v. 85, May 1957, p. 178-179.

Gamma-ray source and Geiger tube detectors and counter used for plotting stock height in cupola and controlling charging bucket and hot blast. (W18d, S19, 1-2)

251-W. Rolling Mill Engineering Practice. Pt. 1. Roll-Neck Bearings. F. G. Thomson. *Iron and Coal Trades*

Review, v. 174, Apr. 26, 1957, p. 985-988.

Evolution and development of roll-neck bearings. 3 ref. (W23m, 1-2)

252-W. Rolling Mill Engineering Practice. Pt. 2. Rolling Mill Tables. F. G. Thomson. *Iron and Coal Trades Review,* v. 174, May 3, 1957, p. 1041-1042.

Discussion on the design of tables with emphasis on bearings. (W23m, 1-2)

253-W. Tinplate Manufacture. John H. Mort. *Iron and Steel,* v. 30, Apr. 1957, p. 131-136.

Equipment used in cold reduction of steel sheet and in continuous electrotinning in plants in South Wales. Evaluates productivity and presents formula for assessing performance for these and other installations. (To be concluded.) (W23f, W3d, 1-2; ST, *Sn*)

254-W. Metallic Recuperators. W. Ernest and C. B. Tupholme. *Iron and Steel,* v. 30, Apr. 1957, p. 139-142.

Relative advantages and efficiency of high-temperature, metallic heat recovery and heat exchanger devices. Consideration of theoretical aspects and metallic heat exchanger design. Heat resistant steels, their resistance to cracking, scaling and problems in fabrication. (To be concluded.) (W13b, 17-7; ST, SGA-h)

255-W. Induction Melting. New Birlec Mains Frequency Furnace of International Combustion, Ltd. *Iron and Steel,* v. 30, Apr. 1957, p. 151-152.

Description of 300-kw., 5-ton capacity furnace operated on 50-cycle current and its use in production of spheroidal graphite cast iron. (W18a, 1-2, E10r; CI-r)

256-W. Evaluation of Cast Refractory Hot Top Linings. R. J. Tatousek and A. T. Peters. *Journal of Metals,* v. 9, Apr. 1957, p. 582-585.

Results of program at Inland Steel to evaluate performance of regular and reduced volume, cast refractory and brick-lined hot tops for ingot molds. Cast linings had longer life but were more costly and difficult to install. (W19c, 1-2; RM-h)

257-W. Production of the Renault Dauphine. *Machinery,* v. 90, Apr. 12, 1957, p. 792-812.

Description of automated section for machining cylinder block castings. Covers milling, holding and transfer equipment. (W25r, 1-2; ST)

258-W. Laminations Relieved by Continuous Process. *Metalworking Production,* v. 101, Apr. 12, 1957, p. 629-630.

Continuous electrical resistance furnace with protective nitrogen atmosphere for annealing cold rolled silicon steel transformer laminations. (W27j; 1-2, 1-11, J23; ST, *Si*)

259-W. Forming Intricate Passageways With Removable Sheathed-Tube Cores. Robert F. Dalton. *Modern Castings,* v. 31, May 1957, p. 91-93.

Soft copper tubes covered with woven fiber glass are used for coring passageways in aluminum alloy castings; woven stainless steel braiding used for covering copper tubes to core magnesium castings; copper tube cores removed by acid solution; limitations and costs of operations. (W19g, 1-2; Al)

260-W. Make Pickling Tank Linings Last Longer. Carl M. Jacobson. *Steel,* v. 140, p. 172-175, 179.

Preventive maintenance in pickling operations; selection of lining materials and equipment; hints for maximum service life. (W10a, L12g, 1-2)

261-W. Stainless Steel Filters. Jarda Polak. *Tech Engineering News,* v. 39, Apr. 1957, p. 46-47.

Stainless steel filters made by powder methods are finding large-scale application in industry. They exhibit high strength and good corrosion resistance at temperatures up to 500° C. They are easily made in a wide variety of shapes and sizes, and in as many degrees of porosity as ordinary metal screens. (W13, 17-7; H general; SS)

262-W. Vacuum Process: Precise Heat Treat, Brazing Method for Assemblies. John J. Lawless, Jr. *Western Metals,* v. 15, May 1957, p. 47-49.

Vacuum furnaces prove useful for precision brazing and heat treating operations on variety of materials including titanium, stainless steels and iron alloys with magnetic properties. (W29m, 1-3, 1-23; Ti, SS, Fe)

263-W. (Czech.) **Refractory Linings of Rotary Furnaces for Blooming Mills.** Eugen Viktora and Vaclav Zavesky. *Hutnické Listy,* v. 12, no. 5, May 1957, p. 417-423.

Chemical processes occurring in the contact area between melt and lining; durability of linings. (W18b, 1-2; RM-h)

264-W. (French.) **Rail Transport of Hot Ingots and Molten Metal.** *Usines d'Aujourd'hui,* no. 33, p. 28-32.

Technical problems involved in rail transport of a steel ingot weighing 52,000 kg. at 750° C., and of molten metal at about 1400° C. (W12p, 1-2; ST)

265-W. (French.) **New "Steckel" Hot Rolling Mill Train at the Forges d'Hennebont.** *Usines d'Aujourd'hui,* no. 33, p. 37-44.

Modernization of 100-year-old plant employing some 1700 workers. (W23, 1-2)

266-W. (French.) **New Aluminum Wire Rolling Mill at the Trefileres et Laminoirs at Harve.** Jean Herenguel. *Usines d'Aujourd'hui,* no. 34, p. 69-73.

New installation will produce 8000 tons per year of aluminum conductor wire and "Almelec" wire. Equipment, plant layout, photos. (W24k, 1-2; Al)

267-W. (German.) **Automatic Equipment of the Openhearth Furnace Operated by Unpurified Hot Generator Gases.** Harry Stollberg. *Neue Hutte,* v. 2, Apr. 1957, p. 220-226.

Structure of the openhearth furnace automation equipment employed; general principle of the gas-air proportional control and intake; gas-air ratio; roof temperature control; efficiency and applications; equipment used. 3 ref. (W18r, 1-2, 18-24)

268-W. (German.) **Behavior of the Surface of Rolls During the Rolling Process.** Wilhelm Hesse. *Stahl und Eisen,* v. 77, May 30, 1957, p. 715-727.

Theoretical principles for the formation of fractures and surface defects on the rolls; static and dynamic causes of the fractures; stresses caused by temperature variations, by the method of fabrication used and by mechanical strain during rolling; comparison of the theoretical considerations with examples of practical operation; examples of scaling and cracking of the surface with different methods of rolling and different qualities of rolls; effect of a surface treatment of the rolls on the formation of cracks. (W23k, 17-7; ST, 9-21, 9-22)

269-W. Factors Affecting Ingot-Mould "Life". *Foundry Trade Journal,* v. 102, May 16, 1957, p. 615.

Important factors for steel ingot molds are mold cleanliness, temperature and coating. (W19c, 1-2)

270-W. Vertical Heat Treating in Large Drop-Bottom Furnace Minimizes Distortion. *Industrial Heating,* v. 24, Apr. 1957, p. 836-843.

Vertical drop-bottom electrical resistance furnace with working diameter of 6 ft. and working height of 22 ft. capable of hardening, annealing, stress-relieving or normalizing steel or aluminum. (W27j, 1-2)

271-W. Iron Powder Electrodes Success or Failure. D. L. Mathias. *Industry and Welding,* v. 30, June 1957, p. 55-58, 85.

Performance characteristics of iron powder electrodes; improved arc action due to iron powder in coating; increased rates of depositions found only in electrodes with high percentage in covering. (W29h, 1-2)

272-W. Metallic Recuperators. Their Application to Industrial Furnaces. W. Ernest and C. B. Tupholme. *Iron and Steel,* v. 30, May 1957, p. 193-195.

Briefly describes important designs of metallic recuperators on the market and their range of application. Designs capable of being used on soaking pits and reheating furnaces with waste gas temperatures up to 1400° C. (W20g, W20h, 1-2)

273-W. Mill Requirements Point to Five-Zone Furnace. J. E. Hovis. *Iron and Steel Engineer,* v. 34, Apr. 1957, p. 98-104.

Review of heating requirements. Five-zone furnace is suggested as an improvement in continuous reheat furnace design, which can meet high mill demands within the minimum furnace length and yet achieve product flexibility. (W20h, 1-2)

274-W. Century of Cowper Stoves. Daniel Petit. *Iron and Steel Institute, Journal,* v. 185, Apr. 1957, p. 501-509.

Brief account of life and work of Edward Alfred Cowper, 1819-1893, inventor of hot blast stove for blast furnace. Survey of modern plant and practice with comparison between European and U.S. installation. Outlines possible future developments in blast stoves. (W17m, 1-2)

275-W. Planning the Conversion of a High-Life Slabbing Mill to a Universal Mill. C. E. H. Morris and R. N. Dale. *Iron and Steel Institute, Journal,* v. 185, Apr. 1957, p. 532-552.

Outlines engineering design of universal slabbing mill to replace 45 in. x 115-in. high-lift slabbing mill. (W23a, 1-2)

276-W. Developments at the Worthington Iron and Steel Co.'s Plant. *Machinery,* v. 90, May 31, 1957, p. 1239-1241.

A 10-year, $25,000,000 improvement program to enable more efficient

production of rails and other permanent-way materials included new coke ovens, boiler house plant and cogging mill, reconstruction and electrification of rail rolling mill, replacement of re-rolling mill. A Bessemer Memorial School was built and equipped for training apprentices, operators and other staff. (W10, W23, 1-2, A3; ST)

277-W. Recent Heat Treat Furnace Installations. *Metallurgia,* v. 55, June 1957, p. 275-293.

Annual survey of developments in design and construction as seen in new installations in Great Britain. Trends are toward heat treat equipment that can be placed in production line with machine tools and furnaces and which will impart greater impact, fatigue and high-temperature strengths to materials treated. (W27, W28, 1-2)

278-W. Lead Melting for Cable Making. Temperature-Controlled Furnace. *Metallurgia,* v. 55, June 1957, p. 293-294.

Principal features of series of 1 to 5-ton furnaces with safety features and temperature control developed by Monometer Mfg. Co. Ltd. (England) for melting of pure lead and lead alloys. (W18, 1-2; Pb)

279-W. Metallurgical Aspects of Calder Hall. Tom Bishop. *Metal Progress,* v. 71, June 1957, p. 65-71.

The first nuclear power plant in the world to produce electricity for general use on a large scale has gone into operation smoothly and satisfactorily, and is fulfilling all the best hopes of its British designers. Metallurgical problems solved include uranium fabrication and canning, selection of steels for pressure vessels, their erection and stress-relief. (W11, T11, 17-7)

280-W. Atmospheric Water Vapor Effects on D-C Arc Electrode Burn-Off Rates. R. H. Benner, 2nd, and T. B. Jones. *Welding Journal,* v. 36, May 1957, p. 263s-264s.

Effects of water vapor content from 0.15 to 16% by volume on the burn-off rate of copper, iron or tungsten; electrodes with arc currents from 20 to 200 amp. 8 ref. (W29h, 1-2)

281-W. (German.) **Coiler in the Age of Rationalization.** Werner Osterland. *Draht,* v. 8, May 1957, p. 176-179.

A review of wire coilers available for common and special winding operations with special emphasis on the extent of automation of each. (W24k, 1-2)

282-W. (German.) **The Grinding Wheel, an Expensive Tool.** Emanuel Fuchs. *Giesserei,* v. 44, June 6, 1957, p. 354-356.

Difficulties encountered in determining the most economic grinding wheel; problems of control of grinding wheel quality; suggestion for a solution of these problems. (W25s, E24j, 1-2)

283-W Core Oil "Oxidation". Victor Rowell. *Foundry,* v. 85, July 1957, p. 104-105.

Tests indicate that new core oil with synthetic resin develops strength even in the absence of oxygen. (W19g, 1-2, NM-h)

284-W. Application of Eddy-Current Adjustable Drives in the Steel Industry. Thomas Skarakis. *Iron and Steel Engineer,* v. 34, May 1957, p. 95-98.

Principles, efficiency, control and application to rolling, forming and slitting mills of eddy-current couplings used in connection with squirrel cage or synchronous motors to provide wide range of stepless adjustable speed and torques. (W23n, 1-2)

285-W. Plastic Refractory in Slab Heating Furnaces. Robert A. Smith. *Iron and Steel Engineer,* v. 34, May 1957, p. 99-103.

Installation and experiences with plastic refractory roof and walls in strip mill heating furnace. (W20h, 1-2; RM-h)

286-W. Preset Screwdown Control of Reversing Rougher at Granite City Steel Co. A. W. Schlechte and C. Allan Schurr. *Iron and Steel Engineer,* v. 34, May 1957, p. 109-116.

Integrated automatic controls on four-high reversing-roughing mill include automatic preset screwdown controls for horizontal rolls and for vertical edger rolls and automatic short-travel limit switches for front and back side guides. (W23a, X20, 1-2; ST)

287-W. Gas Firing for Furnaces. A. Higgs. *Metal Industry,* v. 90, April 26, 1957, p. 332-334.

British users of producers gas and fuel oil find that conversion of annealing furnaces and billet heating furnaces to use of commercial gas is economical. (W27g; 1-2)

288-W. Moving Foundry Materials. Pt. 2. Pneumatic Conveyors: Pipeline for Sand Handling. *Modern Castings,* v. 31, June 1957, p. 49-51.

Pneumatic conveyors require minimum of space, reduce dust problems and move large amount of bulk material economically; essentials of pneumatic systems; installations for handling core and molding sand. (W12r, W19h, 1-21)

289-W. Vacuum Heat Treating Takes Hold. R. R. Giler. *Steel,* v. 141, July 15, 1957, p. 108-110. (CMA)

The titanium and aircraft industries are the chief users of vacuum heat treatments for degassing and stress-relieving. Many batch-type vacuum furnaces are in use and a semi-continuous design is being proposed. The problem in continuous units is the operation and maintenance of inner valves. To cool a load to room temperature a flood of argon is circulated by a fan. With titanium a fan is not needed because it can be exposed to air at 800° F. (W27, 1-23)

290-W. (German.) **A Progress Report on Recuperator Design.** Gert Wellensiek. *Giesserei,* v. 44, Apr. 25, 1957, p. 245-247.

Thermal conditions for the operation of recuperators; description of design with radiation and convection sections assembled in one structural unit; thermal and operational advantages of this new design over conventional recuperator systems for use with hot blast cupola furnace. (W18d, 1-2, 17-1)

291-W. (German.) **A New Method for the Manufacture of Pattern Plates for Machine Molded Castings.** Heinrich Ropat. *Giessereitechnik,* v. 3, May 1957, p. 103-105.

A method based on models which are split or plain on one side, offering a contact area. (W19j, 1-2)

292-W. (German.) **Some Comparisons Between Induction Melting Furnaces for Nonferrous Metals With and Without Gutters.** O. Junker. *Metall,* v. 11, Jan. 1957, p. 37-39.

Disregarding higher current usage, the induction furnace without gutter has the advantage of greater safety of operation and of ease in lining. In melting aluminum and its alloys gutter cleaning can be omitted. It is also very suitable for copper, nickel and their alloys. 2 ref. (W18a, 1-2; Al, Cu, Ni)

293-W. (German.) **Blast Furnace Operation With and Without Cooling Boxes.** Georg von Struve. *Neue Hütte,* v. 2, Feb-Mar. 1957, p. 138-142.

Blast furnaces equipped with external drip coolers or with plate cooling were found to be most efficient. Thinwall construction of blast furnaces is recommended. 4 ref. (W17g, 1-2; Fe)

294-W. (German.) **Application of Basic Brick Work in Openhearth Furnaces.** Karl Leitner. *Neue Hütte,* v. 2, Feb-Mar. 1957, p. 142-154.

Relation of productivity to type of refractory and type of construction; roof problems; cause of brick wear; internally reinforced bricks; Radentheimer roofs. 7 ref. (W18r, 1-2; RM-h)

295-W. (German.) **Measuring and Regulating Operations in Industrial Furnaces According to a Selected Example.** Karl Reinhard. *Werkstatt und Betrieb,* v. 90, Apr. 1957, p. 233-238.

Measuring and regulating methods in industrial furnaces are described using as an example a continuous tempering furnace for the processing of sheet metal. The measurements and regulation of temperature, control of fuel, pressure regulation of air and fuel, chamber pressure regulation and recuperator regulation are treated. (W27, X9, X12, 1-2)

296-W. (German.) **Some Special Types of Industrial Furnaces.** Reinhold Schlimm. *Werkstatt und Betrieb,* v. 90, Apr. 1957, p. 241-244.

Modern furnace installations for soft annealing and the interior varnish baking of aluminum tubes; continuous annealing furnaces for gold foil metal bands; annealing furnaces having inclined double drums for annealing mass-produced small parts in an inert gas. (W27, J23, 1-2)

297-W. (German.) **High-Duty Electrodes.** K. L. Zeyen. *Werkstatt und Betrieb,* v. 90, June 1957, p. 341-349.

Reviews the present state of development of high-duty electrodes; discusses output, current-carrying capacity and welding efficiency. (W29h, 1-2)

298-W. (Japanese.) **Investigation of Sand Molds; Effect of Mold Coating.** Goro Ohira and Mahito Koizumi. *Casting Institute of Japan, Journal,* v. 29, May 1957, p. 342-348.

The thermal behavior of mold coating investigated by differential thermal analysis. Graphite and silica coatings were examined together with alumina, metallic silicon, aluminum and mica. Comparative analysis of results. (W19g, 1-2)

299-W. (Japanese.) **Life of Large Ingot Molds Made of Ductile Cast Iron.** Tetsuo Kitashima and Tadanobu Kono. *Iron and Steel Institute of Japan, Journal,* v. 43, Apr. 1957, p. 437-444.

Experiments were made on large ingot molds, C-61 type-(weight: 5,230 kg., wall thickness: 130 mm.) and C-56 type-(weight: 4,900 kg., wall thickness: 125 mm.) used at Yawata Iron and Steel Works, for the purpose of comparing ductile cast iron with ordinary cast iron. Results showed that the ductile cast iron mold had a longer life. On the other hand some peculiar defects appeared on this inner surface in the course of ingot making. Surface crazing and cracking and changes in microstructure are discussed. 4 ref. (W19c, 17-7; CI-r)

300-W. (Japanese.) **Study on Charcoal Pig Iron for Chilled Iron Rolls. Pt. 1. Structural Characteristics and Gas Content.** Kokichi Otani. *Iron and Steel Institute of Japan, Journal,* v. 43, Apr. 1957, p. 444-450.

Charcoal pig iron is supposed to possess a better suitability for producing chilled iron rolls than other pig irons such as coke pig iron, electric pig iron and remelted pig iron. Three laboratories in Japan (Mechanical Laboratory of Japanese Government, Metal Research Institute of Tohoku University, Laboratory of Mitsubishi Kozai Co. Ltd.) have carried out gas analyses of these four types and it was found that little difference existed. 24 ref. (W23k, 17-7, N15d; CI-a)

301-W. (Polish.) **Blast Furnace Charging.** Zygmunt Krotkiewski. *Hutnik,* v. 24, Jan. 1957, p. 1-10.

Charging equipment now in operation which enables a uniform distribution of the gas passage through the charge; Tesch experiments and charging equipment; results of small-scale experiments with new design. (W12b, W17g, 1-2; Fe)

302-W. (Polish.) **Blast Furnace Throat Locking Distributing Device.** Zygmunt Krotkiewski. *Hutnik,* v. 24, Feb. 1957, p. 47-51.

Description of Brown, Becker and McKee distributing devices; an improved design is described. (W17g, 1-2)

303-W. (Polish.) **Metallic Recuperators.** Aleksander Stojek. *Hutnik,* v. 24, Feb. 1957, p. 58-61.

Progress in metallic recuperator design; means of lowering temperature of the heat exchange unit walls; construction and installation of heat exchange units; metallic recuperators as safety devices against overheating and burning. (W17, W18, 1-2)

304-W. (Russian.) **Mold Drying by Infrared Rays.** E. P. Polishuk. *Liteinoe Proizvodstvo,* no. 2, Feb. 1957, p. 1.

An apparatus fitted with infra-red electric lamps for sand mold drying. (W19k, 1-2)

305-W. (Russian.) **Shot Blast Cleaning Table-Model 353.** D. M. Litvin and L. L. Koblentz. *Liteinoe Proizvodstvo,* no. 2, Feb. 1957, p. 9-11.

Difficulties of efficient casting cleaning. Characteristics of five shot blast cleaning machines; the details of model 353, together with the diagrams. (W2r, 1-2)

306-W. **Some Metallurgical Aspects of a Gas Turbine Engine.** S. Heslop. *Birmingham Metallurgical Society, Journal,* v. 37, June 1957, p. 497-523.

Use of gas turbine engines in airplanes, automobiles and for electrical power generation; compressor units, axial turbines, turbine nozzle and heat exchanger units are considered in relation to metallurgical and manufacturing requirements due to high temperature and to high stress conditions found in engine operations. 9 ref. (W11m, 17-7; SGA-h)

307-W. **The Mains Frequency Coreless Induction Melting Furnace.** *Castings,* v. 3, Apr. 1957, p. 7-15.

Brief outline of design and manufacture. Discussion of channel vs. coreless type. (W18a, 1-2)

308-W. **Britain's First Mains Frequency Coreless Induction Melting Furnace.** *Combustion Boiler House and Nuclear Review,* v. 11, May 1957, p. 227-229.

Basic principles, installation layout, furnace design and details of operation of a 300-kw., 5-ton capacity furnace. (W18a, 1-2)

309-W. **Rotary Hearth Furnaces Geared for Automation in Shell Production Line.** Arthur Q. Smith. *In-*

dustrial Heating, v. 24, June 1957, p. 1128-1142.

Furnaces in production line for 155-mm. shells from billets of 1040 steel; furnaces include 20-ft. diameter rotary-hearth gas-fired forging furnace, furnace for heating shell noses, 17-ft. rotary gas-fired hardening furnace, 20-ft. rotary draw furnaces. (W27g, 1-2, T2j; CN)

310-W. High-Quality Copper Tube Redrawing Requires Precise Heating and Rigid Process Control. V. Peterson. *Industrial Heating*, v. 24, June 1957, p. 1146-1158.

Furnace units and their control including continuous gas-fired screw conveyor furnace for heating billets before piercing; direct gas-fired roller hearth furnace for continuously annealing tubing after initial drying operations, and radiant tube heated controlled DX generated gas atmosphere roller hearth furnace for finished annealing.
(W27g, 1-2; Cu, 4-10)

311-W. New Furnace Heats to 6000° F.—in Minutes. P. M. Unterweiser. *Iron Age,* v. 179, June 20, 1957, p. 98-99.

Resistance-type furnace designed in Germany operates from standard 220-volt power source. Melts pure tungsten in less than 5 min.
(W18, 1-2; W)

312-W. New Furnaces Treat Giant Forgings and Extrusions. R. R. La-Pelle. *Iron Age,* v. 180, July 11, 1957, p. 106-107.

Large car-type furnaces at Harvey Aluminum have loading area 15 by 30 ft. with 7-ft. height and loading capacity of 225,000 lb. Heat treating furnace handles 80-ft. extrusions; height over 106 ft. above floor level; quench pit 110 ft. below floor level. (W27, 1-2; Al, 4-1, 4-8)

313-W. Structure of Ingot Moulds. *Iron and Coal Trade Review,* v. 174, May 24, 1957, p. 1205-1206.

Ingot molds, normally made from hematite cast iron are subjected to severe heating and cooling during service which may significantly alter the microstructure. Tests were made on molds from a number of different works, the majority being in the 4 to 5-ton capacity range, but additional information was available on molds of up to 15-tons capacity. Structure examination was made before and after service. 5 ref. (W19c, 17-7, M27; CI)

314-W. Experimental Results With Hollow Electrodes in Electric Steel Furnaces. W. E. Schwabe. *Iron and Steel Engineer,* v. 34, June 1957, p. 84-91.

Hollow electrodes offer certain advantages during meltdown, such as steadier arc, higher and more uniform level of useful power, but at a higher consumption rate and consequently higher electrode costs per ton of steel. (W18s, 1-2; ST)

315-W. Economics of Oxygen Generating Stations for Steel Mill High and Low-Purity Oxygen Applications. Arthur E. Steele and Donald E. Cummings. *Iron and Steel Engineer,* v. 34, June 1957, p. 114-124.

Low-cost oxygen from generating stations renders obsolete the practice of buying from a distributor. Costs for oxygen will run from \$5 per ton to \$26 per ton depending on demand, purity and continuity of operations. (W18g, 1-2, 17-3)

316-W. Design and Construction of Fontana Open Hearth Precipitators. E. V. Akerlow. *Iron and Steel Engineer,* v. 34, June 1957, p. 131-138.

Experience with cleaning open-hearth gases at Kaiser indicates that best results are obtained with special collecting and discharge electrodes, selenium instead of mechanical rectifiers, specially developed gas distribution apparatus and the use of wrapping mechanism.
(W17n, 1-2)

317-W. Method of Testing Open Hearth Precipitators. J. H. Smith and G. L. Rounds. *Iron and Steel Engineer,* v. 34, June 1957, p. 139-141.

To determine true cleaning efficiency of precipitators continuous sampling methods were required; a dry method of cleaning probes was necessary. It was found that the "ashed" method of weighing thimbles is more convenient. Flows and velocities were calculated by computing machines. (W17n, 1-4)

318-W. Automatic Gage Control for Cold Reduction Mills. R. A. Phillips and H. S. Maxwell. *Iron and Steel Engineer,* v. 34, June 1957, p. 149-158.

Operation of various types of cold reduction mills to explain how and why automatic gage control systems differ for various types of mills. 5 ref. (W23f, X20c, 1-2)

319-W. Basic Hot Blast Cupola as Source of Hot Metal for Steel Plants. E. S. Harman and Siegfred Tunder.

Iron and Steel Engineer, v. 34, June 1957, p. 159-166.

Operation, effect upon openhearth production rates, economics of installation and operation. (W18d, 1-2, D2; ST)

320-W. Solar Furnace for Research in Nonferrous Metallurgy. W. Marvin Tuddenham. *Journal of Solar Energy Science and Engineering,* v. 1, Apr-July 1957, p. 48-51.

The installation and its characteristics; projected uses include: (1) to develop techniques for improved copper recovery from ores; (2) to improve the quality of refined copper. (W18, 16-13; Cu)

321-W. Solar Furnace Research in Non-Ferrous Metallurgy. W. Marvin Tuddenham. *Mines Magazine,* v. 47, Mar. 1957, p. 109-111.

Design, construction and features of a solar furnace. Experiments show that it is possible to melt columbium (melting point 4532° F.), but not rhenium (melting point 6224° F.) (W18, 16-13; Cb)

322-W. (German.) **New Developments in Furnace Construction for Drop Forgings.** E. Pflaume. *Fertigungstechnik,* v. 7, Feb. 1957, p. 63-64.

Increased use of pusher and gravity discharge furnaces; utility of rotary furnaces; increase of oil firing for economic and pyrometric reasons. 2 ref. (W20h, 1-2, F22n)

323-W. (German.) **Casting Molds, Core Boxes and Patterns of Synthetic Resins.** E. Erdmann. *Giesserei Praxis,* v. 75, June 10, 1957, p. 232-234.

Advantages and disadvantages in the use of synthetic resins for casting molds and core boxes, construction of such molds and boxes, detailed working procedures. (W19g; NM-d)

324-W. (German.) **Economic Superiority of Welded Light-Weight Construction in Modern Crane Manufacture.** Willi Wellnitz. *Schweissen und Schneiden,* v. 9, June 1957, p. 253-257.

Satisfies the requirements of port authorities and crane users with respect to low wheel pressure, cost of maintenance and better performance. (W12r, 7-1)

325-W. (German.) **Modern Welded Designs in Conveyor Equipment.** H. Bückreiss and Th. Schaaf. *Schweissen und Schneiden,* v. 9, June 1957, p. 257-260.

Dynamically stressed conveyor plants are more and more of welded construction. With the help of three examples of conveyor equipment—a sloping conveyor for a blast furnace, a loading bridge and a new type of jib support for rope conveyor across the Rhine, the following important points are described; design from the point of view of architectural appearance; maintenance; weight; manufacturing cost; cost of erection. (W12r, 7-1)

326-W. (German.) **Crab in Welded Construction for a Foundry Crane to Lift up to 160 Tons, With a Gear Box Designed as a Load-Carrying Component.** H. Andres. *Schweissen und Schneiden,* v. 9, June 1957, p. 261-262.

The welded steel frame and the welded gear box form a load carrying unit of low over-all height and pleasing appearance. All bearing supports are welded to the main frame and bored after welding. (W12q, 7-1)

327-W. (German.) **Welded Heavy Gear for Cargo Loading.** M. Komers and J. Menneng. *Schweissen und Schneiden,* v. 9, June 1957, p. 264-265.

Until recently light loading gear has been produced from seamless or welded tube up to 400 mm. diameter. For heavy loading gear, which is welded without exception, diameters up to 2240 mm. and wall thicknesses up to 70 mm. are now used. (W12q, 7-1)

328-W. (German.) **Welded Machine Tools for Cutting Sheets.** Ludwig Erlinghagen. *Schweissen und Schneiden,* v. 9, June 1957, p. 274-275.

Welding is becoming increasingly important in the manufacture of machine tools. Examples include welded machine tools for cutting long sheets. Rotary shears can be used for straight and inclined cuts. Lengths of cutting up to 15 m. are possible. (W24m, 17-7; 7-1)

329-W. (German.) **Large Size Crushing Equipment in Welded Construction.** H. Rühl. *Schweissen und Schneiden,* v. 9, June 1957, p. 276.

For the preliminary breaking of 1100 × 1800 × 1000-mm. pieces in stone quarries, large-size or single-arm crushers are used. Material is broken down to pieces of 250-mm. edge length. Cast construction had various disadvantages and a welded design has been developed. The welded machine is 20% lighter than

the cast one, and because of various design features possesses important advantages over the cast steel construction.
(W28, 17-7; ST, 17-1)

330-W. (German.) **Influence of Welding in the Design of Steelworks Plant.** O. Wilmes. *Schweissen und Schneiden,* v. 9, June 1957, p. 284-286.

Welded converters are 20% cheaper than riveted ones, possess perfect tightness and can easily be repaired by welding. Welding is also applied to the manufacture of rolling mill equipment where brackets, supports, etc., can be welded onto the roll frames if necessary, thus reducing their manufacturing cost.
(W10, W18, W23, 7-1)

331-W. (German.) **Influence of Welding on the Manufacture of Heavy Machinery and Presses.** Hanns Ginzler. *Schweissen und Schneiden,* v. 9, June 1957, p. 286-289.

The advantages of welded steel design in the construction of steel rolling machinery and presses can be fully exploited even under very difficult conditions in that welded construction reduces manufacturing cost. The designs show a pleasing and suitable appearance and the structural weight is usually reduced.
(W23, W24g; ST, 7-1)

332-W. (German.) **Welded Hydraulic Presses.** C. Hüttenes. *Schweissen und Schneiden,* v. 9, June 1957, p. 290-292.

Design, operation, economic advantages and use of welded construction. (W24g, 17-7, 1-7)

333-W. (German.) **Progress of Welding in Diesel Engine Manufacture.** Fritz Schmidt. *Schweissen und Schneiden,* v. 9, June 1957, p. 310-312.

Parts of the frames for very large engines have been welded, as well as many other components such as housings, starter bottles, exhaust silencers. Full success has been encountered in welding steel castings to plates. In spite of the heavy loading conditions in marine engines, no cracks were experienced in the large weldments. All important weldments are stress relieved. For the welding of exhaust turbines special welding procedures are employed such as preheating to a precise temperature, the use of special electrodes and sometimes argon-arc welding. (W11j, 7-1)

334-W. (German.) **Welding in the Manufacture of Electrical Machinery.** Hermann Oschanitzky. *Schweissen und Schneiden,* v. 9, June 1957, p. 324-328.

The frames of medium and large-size electrical machines are now welded almost without exception and welding has also been introduced more and more in the manufacture of smaller machines. Supporting structures for hydro-electric power plant as well as covers, bed plates, etc., are also constructed by welding. Apart from the stationary components of electrical machines rotors are often fabricated. Cast steel parts are frequently welded to steel plate components. The use of flame cutting and spot welding has also reduced the cost of manufacture. (W11q, 7-1)

335-W. (German.) **Results of Conversion of Heating Furnaces to Fuel-Oil Firing.** Karl Wilhelm Dockhorn. *Stahl und Eisen,* v. 77, July 11, 1957, p. 933-939.

Use of fuel-oil caused by the increasing cost of conveying, pulverizing and gasification of solid fuels; storage and supply plants; power required for heating and pumping the oil; modification of the boiler; pusher-type furnace and forging furnaces; burners; method of operation; heat consumption; utilization of the waste gases by means of recuperators; economic efficiency of fuel-oil firing. (W10, A11e; RM-k30)

336-W. (Italian.) **Melting Equipment.** M. Olivo. *Fonderia Italiana,* v. 6, Feb. 1957, p. 49-53.

Cold and hot blast cupolas and their linings; metallurgical blast cupolas; electric arc and induction furnaces, with emphasis on improvements during past ten years.
(W18d, W18s, W18a, 1-2)

337-W. (Italian.) **Study of the Behavior of Ingot Molds in Service.** Mario Cetin. *Fonderia Italiana,* v. 6, May 1957, p. 193-200.

Conditions of use and effects on life of molds; design and casting defects; specific consumption of molds. 7 ref. (W19c, S21)

338-W. (Italian.) **Use of Special Types of Synthetic Resins in the Construction of Patterns and Core Boxes.** Enrico Balocco. *Fonderia Italiana,* v. 6, May 1957, p. 209-214.

Types of resins used in foundry accessories; suggestions for construction of such accessories; service life and cost comparison with metal items. (W19m; 1-2; NM-d)

339-W. (Polish.) **The Gas Turbine as a New Power Source in Metallurgy.** Kamil Czwiertnia. *Hutnik,* v. 24, Jan. 1957, p. 11-17.

Trends of gas turbine application in metallurgy; application to blower driving; gas turbine for production of hot blast; application for utilization of energy contained in outlet gases of blast furnaces fed with a blast under pressure. 15 ref. (W11m, 1-2)

340-W. (Russian.) **Conveyor Drier With Natural Recirculation.** L. M. Marienbach. *Liteinoe Proizvodstvo,* no. 1, Jan. 1957, p. 4-6.

Several plants for drying molds, utilizing recirculation of foundry hot gases. 4 ref. (W19k, 1-2)

341-W. (Russian.) **Continuous Process Cleaning Drum.** M. I. Uskov and N. G. Popov. *Liteinoe Proizvodstvo,* no. 1, Jan. 1957, p. 7.

Casting cleaning apparatus which processes the castings at 500-600° C. (W3b, 1-2, 5)

342-W. (Russian.) **Bench Sand Blowing Machine for Coremaking.** N. I. Durnev. *Liteinoe Proizvodstvo,* no. 4, Apr. 1957, p. 17-18.

Each machine serves two coremakers; one fills the reservoir with a five-component core material, then blows it into the corebox; the other opens the box and piles the cores on the drying board. Thus, 1400 four-compartment coreboxes are filled in a single shift. At present the operation for filling the reservoir is being mechanized. (W19h, 1-2)

343-W. Precision Barrel Finishing. Pt. 2. William E. Brandt. *Automatic Machining,* v. 18, July 1957, p. 49-53.

Barreling equipment; drum shape and size, speed and horsepower, provisions for safety and maintenance. (W2s, 1-2)

344-W. New Flux Electrode Welds Steel. *Canadian Machinery,* v. 68, June 1957, p. 201-202.

Dual-Shield method is a combination of flux-cored electrode and carbon dioxide shielding gas. Granulated flux additive contains an ionizer, deoxidizer and slag-forming agent. (W29h, 1-2; ST)

345-W. Selection and Application of Material Handling Equipment. John J. Watson. *Foundry,* v. 85, Aug. 1957, p. 86-99.

Shakeouts, hoppers, feeders, conveyers, storage, sand mixers, automation and system layout. (W19h, W12, E general, 18-17)

346-W. Gas-Fired Forging Furnaces Aid Reduction of Metal Losses. Arthur Q. Smith. *Industrial Heating,* v. 24, July 1957, p. 1336-1342.

Scale formed in gas-fired furnace is easily removed. Scale loss can therefore be accurately determined and billet weight held to a minimum. (W20h, F22; 9-2)

347-W. How to Get the Most Out of Your Iron Powder Electrodes. *Industry and Welding,* v. 30, Aug. 1957, p. 27-31.

Comparison of iron powder and conventional electrodes in principle and practice. (W29h, 1-2)

348-W. Some Facilities for the Study of Plutonium and Its Alloys. G. K. Williamson, D. M. Poole and J. A. C. Marples. *Institute of Metals, Journal,* v. 85, June 1957, p. 431-436.

Glove-boxes and apparatus for the safe handling, heat treatment, X-ray and metallographic examination of plutonium and its alloys. 11 ref. (W12a, X4, 1-2, Pu)

349-W. (Italian.) **Hot Milling Machine for Ingots.** *Tecnica Italiana,* v. 22, Mar. 1957, p. 119-123.

Processing of ingots with hot miller compared with other procedures. Hot milling simplifies preparation cycle, reduces time required to treat ingots before hot rolling, results in minimum heat loss and fewer rejects at rolling stage. Description of Innocenti miller capable of handling ingots weighing up to three metric tons; loading and delivery devices; tooling. (W20j, 1-2; 5-9)

350-W. Co-Operative Trials on All-Basic Furnace Roofs. B. Ceram. *Iron and Steel,* v. 30, June 8, 1957, p. 312-324.

Bricks used in the trials were chromium-magnesite and magnesite-chromium. Results show that design and operation of furnace have a greater influence on life obtained than differences in brick quality. Results do not justify placing the bricks in a definite order of merit, but some conclusions on brick quality could be drawn. (W18r, 1-2; RM-h)

351-W. Extrusion Press Tooling. Pt. 2. Frank Sowa. *Light Metal Age,* v. 15, June 1957, p. 27-30.

Composition of steel and heat treating of liners for container on presses designed for aluminum extrusion; assembly of liner and container; problems in reconditioning containers. (W24g, F24, 1-2; ST)

352-W. Racks for Anodizing. J. E. Bunch. *Metal Finishing,* v. 55, July 1957, p. 45-49.

Factors in the design, selection of coating, and choice of metals for racks used in anodizing; compares aluminum, copper, phosphorus bronze and titanium as rack materials. (W3g, 17-7; Al, Cu, Ti)

353-W. Furnaces for Sintering and Heat Treating Powder Metal Parts. N. K. Koebel. *Metal Progress,* v. 72, Aug. 1957, p. 65-68.

Furnaces for sintering powder metal parts may be of mesh-belt, roller-hearth or mechanical pusher type, depending on requirements. The batch-type vertical radiant tube furnace is particularly suited for hardening sintered iron and steel parts in controlled atmospheres. (W26e, W27, 1-2; 6-22)

354-W. Gas Converters. A Survey of the Operation and Control of Exothermic and Endothermic Converters. Walter Holcroft. *Steel Processing and Conversion,* v. 43, July 1957, p. 398-403.

Factors influencing composition of gas produced by endothermic and exothermic gas generators and method of composition control for protective atmospheres. (W28q, 1-2)

355-W. Testing Electrodes for Usability and Efficiency. Bela M. Ronay. *Welding Engineer,* v. 42, July 1957, p. 34-36.

Diagram of apparatus which permits quick test of electrode deposition qualities and indicates best arc length and current values. Brief description of mild-steel electrodes. (W29h, 1-2; ST)

356-W. Filler Metals for Joining. Orville T. Barnett. *Welding Engineer,* v. 42, July 1957, p. 46-51.

Chemical analyses of E series stainless steel filler metals. Mechanical properties of corrosion resisting steel weld deposits. (W29h, 17-7, Q general; SS)

357-W. (German.) **Salt Impregnation for the Linings of Aluminium Melting and Holding Furnaces.** W. Helling and E. Kistermann. *Aluminium,* v. 33, Aug. 1957, p. 514-520.

In casting aluminum ingots and producing aluminum castings it is important to melt, hold and cast metal with the least possible melting losses and energy consumption and the highest possible output without contamination. In this process silica from chamotte linings of furnaces reacts with liquid aluminum and alloys it with silicon. To eliminate the trouble the pores of the furnace masonry were sealed so as to reduce its surface area and thereby the rate of its interaction with the melt. Sealing by melting a mixture of 80% sodium chloride and 20% cryolite in a furnace was tried out with good results. (W19a, 1-2; Al, RM-h)

358-W. (German.) **New Kind of Pig Mold.** F. Schmidt. *Aluminium,* v. 77, July 25, 1957, p. 523-524.

Possesses close, two-way toothing which makes it easy to build up very stable stacks, with particularly efficient space utilization. The molds are built on a support which is cast separately of the same alloy. This support is fashioned so that it can be lifted from all four sides by a fork lift truck. (W19c, 17-7; Al)

359-W. (Russian.) **Inertia-Type Shaking Screen.** K. A. Chaikovski. *Liteinoe Proizvodstvo,* no. 4, Apr. 1957, p. 15-17.

Mechanical screens shake the sand out of the molds more efficiently than those operated by compressed air. The screens are mounted on spiral springs and set into vibration by rotating eccentric weights. The sand falls into a hopper below. (W19h, 1-2)

360-W. (French.) **Plaster Molds for Bronze With Beryllium.** Louis Grand. *Fonderie,* no. 137, June 1957, p. 265-269.

Comparison with sand casting; casting techniques; applications. 4 ref. (W19g, 1-2; Cu-s, *Be*)

361-W. (German.) **Rectifying Equipment in Modern Rolling Mills.** Hans-Joachim Mau. *Neue Hütte,* v. 2, May 1957, p. 299-307.

Comparison between rectifying drives and drives with rotary transformers and amplifiers; rectifier construction types; application of rectifying drives in continuous mills; reversing mills equipped with rectifying drives; Ward-Leonard transformers provided with rectifying excitation controls; coiling drives

for reversing strip mills; winding drive with a variable speed governor. 14 ref. (W23n, 1-2)

362-W. (German.) **Transverse Flow Determination as an Expedient for the Designing of Rolls for Sectional Steel.** Horst Neumann and Wolfgang Lehmann. *Neue Hütte,* v. 2, May 1957, p. 307-317.

Transverse flow calculation in the case of restricted spreading; transverse flow investigations of sections; utilization of transverse flow calculation for redesigning and new designing of rolls, illustrated by the example of a "goblet iron" roll design; derivation of general rules. 9 ref. (W23k, 1-2, 17-1; ST)

363-W. (German.) **Damage by Undermining of Foundations in Strip Mills.** Alfred Degen. *Stahl und Eisen,* v. 77, July 25, 1957, p. 1018-1027.

Aligning foundations; foundations required in the hot rolling mill for the pusher-type furnace, scalebreaker, roughing stands, roller tables, finishing stands, coilers and sheet pilers. Recommended types of foundations in the cold rolling mill for the pickling plant, four-stand tandem mill train, temper rolling mill stand, shear train and annealing plant. (W10b, W23, 1-2)

364-W. (Italian.) **Ovens With Recirculation Heating Systems.** G. Farnesi. *Fonderia Italiana,* v. 6, Mar. 1957, p. 111-116.

Recent developments in closed circuit heating systems for form driers and core ovens; requirements such ovens should fulfill; advantages of "recirculation" ovens; types; temperature control and safety features. (W19k, 1-2)

365-W. (Italian.) **Electrode Coatings and Their Function.** R. Bostik. *Rivista Italiana della Saldatura,* v. 9, Mar-Apr. 1957, p. 49-53.

Functions of coatings; ionization of arc atmosphere; acid coverings; efficiency of alloy elements in electrodes; basic coatings and properties of metal deposited by basic electrodes; influence of composition of coating and deposited metal on hot cracking, with report of some experimental results. 12 ref. (W29h, 1-2, 17-7)

366-W. (Japanese.) **Study of Glass Mold Materials.** Tomosaburo Mitsui. *Casting Institute of Japan, Journal,* v. 29, Apr. 1957, p. 218-220.

Function, composition and properties. 3 ref. (W19g, 1-2; NM-f42)

367-W. (Japanese.) **Cupola Tuyeres. Report 3. Projecting Water-Cooled Tuyere.** Toshio Suzuki. *Casting Institute of Japan, Journal,* v. 29, Apr. 1957, p. 252-254.

Temperature, pressure and distribution of carbon dioxide in cupola furnace in relation to type of tuyére, angle of tuyére, volume of air and size of coke. (W18d, 1-2)

368-W. (Japanese.) **Combustibility of Carbonaceous Mold Coating Materials.** Yutaka Kawano. *Casting Institute of Japan, Journal,* v. 29, Apr. 1957, p. 325-329.

Combustibility of coatings of graphite and carbonaceous materials at different temperatures. (W19g; NM-k36)

369-W. (Japanese.) **Manufacture of Cast Steel Crankshafts.** Shizuya Maekawa and Takeshi Yamashita. *Casting Institute of Japan, Journal,* v. 29, June 1957, p. 415-426.

Recently, castings have been taking the place of forgings for diesel crankshafts; method of manufacture, chemical composition and mechanical properties of the castings. 4 ref. (W11j, 17-7; ST, 5-10)

370-W. (Japanese.) **Design and Construction of Tap Holes, Slag Spouts and Crucibles for Cupola Furnaces.** Ishino and Kisao Abe. *Casting Institute of Japan, Journal,* v. 29, June 1957, p. 461-465.

Several types of tapholes and their advantages and disadvantages. (W18d, 1-2, 17-7)

371-W. (Russian.) **Study of the Gripping Capacity of Plate Mill Rolls.** M. M. Gorenstein. *Stal',* v. 17, Mar. 1957, p. 239-242.

Substantial improvement in the gripping capacity, and consequently also in efficiency, of three-roll plate mills was attained by the use of one steel and two cast iron rolls. The last pass was made between the cast iron rolls to produce a better surface. Influence of the material of the rolls and that of the composition and temperature of the rolled metal is discussed. (W23b, 1-2)

372-W. (Russian.) **Isobutylene Protective Lining for Pickling Bath Underlayer.** V. L. Vinarsky. *Stal',* v. 17, Mar. 1957, p. 272-273.

For protection against corrosion in pickling baths it has been found expedient to use an underlayer lining made of isobutylene, which is

inexpensive and does not require vulcanization. (W3a, 1-2, L12g)

373-W. (Russian.) **A Study of the Causes of the Formation of Deposits in Wet Gas-Cleaning Installations.** F. I. Belan. *Stal'*, v. 17, Apr. 1957, p. 366-369.

The deposits which are precipitated in the gas-cleaning installations when smelting ferromanganese consist mainly of calcium carbonate. To prevent these deposits it was found expedient to use an additional hollow scrubber installed before the gas-cleaning system, which collected the greater part of the dust particles which the gas contained. (W13c, 1-2)

374-W. (Russian.) **Typical Blast Furnace (2286 Cu. M. Volume): Problems of Mechanization and Automation.** A. E. Sukhorukov. *Metallurg*, v. 2, May 1957, p. 5-8.

General discussion of mechanization and automation of raw material charging, humidification, heating, controls, running, disposal of cast iron, slag and process waste. (W17g, 1-2, 18-24)

375-W. (Russian.) **Increase of Roll Durability on Rolling of Parts With Periodically Varying Profile.** I. I. Bornatzki, E. E. Belousova and N. M. Pavlenko. *Metallurg*, v. 2, May 1957, p. 24-25.

Steel composition and heat treatment. Improved rolls last 3 to 4 times longer. (W23k, 17-7; ST)

376-W. (Russian.) **Thin-Walled Molds for Killed Steel.** A. M. Danilov. *Metallurg*, v. 2, June 1957, p. 19-20.

Experiments with molds of uniform wall thickness show that there is no difference in quality, composition and crystalline structure of the ingots cast in such molds in comparison with the ingots cast in regular molds. New molds have better durability by 23.8%. The design of the new mold is described. (W19c, 1-2; ST)

377-W. (Russian.) **Machine for Speeding up of Openhearth Charging.** A. V. Kolesnikov. *Vestnik Mashinostroenia*, v. 37, Jan. 1957, p. 19-22.

Drawbacks of regular charging equipment; brief descriptions of more advanced machines; detailed description of two machines requiring no furnace alterations. (W12b, D2, 1-2)

378-W. (Russian.) **Blast Furnace Plant Slag Ladle Equipped With New Rigid Fins.** K. A. Pak. *Vestnik Mashinostroenia*, v. 37, Jan. 1957, p. 23-25.

Operation of slag ladles. Service life of ladle is 2 to 3 months only; an improved design with reinforcing fins is proposed and drawings presented. (W19b, D1, 1-2; RM-q)

379-W. (Russian.) **Induction Heater With a Reciprocating Feeder.** Yu. I. Kitajgorodzki, M. G. Kogan and V. A. Tyzlikova. *Vestnik Mashinostroenia*, no. 3, Mar. 1957, p. 57-58.

Induction heaters for heat treatment of billets when fed by pneumatic pushing devices are not suitable for handling of heavy parts and intermittent operation. An induction heater fitted with a reciprocating feeder enables handling of the heavy billets in a batch process. The energy consumption of the heater is 0.6 kw.-hr. per kg. 4 ref. (W28s, 1-2)

380-W. **Sodium Handling at Argonne National Laboratory.** F. A. Smith. Paper from "Symposium on Handling and Uses of the Alkali Metals". American Chemical Society, p. 42-59.

Sodium, used as a heat transfer fluid, can most effectively remove heat from a fast breeder reactor; presents the engineering mock-up of the experimental breeder reactor II and illustrates associated pumps, valves, and instrumentation. (W11p, 17-7, X13; Na, 14-10)

381-W. **Dosco Opens Canada's Biggest Tilting Furnace.** *Canadian Machinery*, v. 68, Aug. 1957, p. 116-118.

A 225-ton, liquid fuel-fired openhearth furnace built on two large rocker girders. It may be tilted forward 25° for tapping and 15° for slagging. (W18r, 1-2)

382-W. **High-Temperature Properties of Mould Refractories.** *Castings*, v. 3, June 1957, p. 15-17.

Effect of heat on properties of clay bonded sands; data on effect of heating on bulk density of bentonite and kaolinitic clay. (W19g, NM-f45, RM-h35)

383-W. **Vacuum Lift Speeds Handling of Sheets on Turret Punch Press.** E. J. Egan, Jr. *Iron Age*, v. 180, p. 94-95.

Vacuum hoist used for loading and unloading sheets as large as 4 x 7 ft. into punch press. (W12q, W24g, 1-2, 1-23; 4-3)

384-W. Scrap Refinery Controls Smoke With Water Scrubber. L. Bykowski. *Iron Age,* v. 180, Aug. 15, 1957, p. 96-97.

Scrubber cleans dust and fumes produced by burning scrap. (W13c, 1-2; RM-p)

385-W. Traveling Hood Exhausts Ingot Fumes. *Iron Age,* v. 180, Aug. 22, 1957, p. 102-103.

Fumes from leaded steel ingot exhausted by traveling hood car which moves with ladle. (W13c, W18n, 1-2; ST, *Pb*)

386-W. Selection and Economy of Equipment for Blooming and Slabbing Mills. Kurt Schlesinger. *Iron and Steel Engineer,* v. 34, July 1957, p. 63-74.

Equipment, plan arrangement and economics of three-high blooming mill, two-high reversing blooming and slabbing mill for medium production and two-high reversing blooming mill for high production. (W23a, 1-2; ST)

387-W. Flexible High Speed Bar Mill at Phoenix. Hugh H. Campbell. *Iron and Steel Engineer,* v. 34, July 1957, p. 77-83.

Equipment in 12-in. bar mill consists of continuous reheating furnace, three-high 20-in. roughing stand, cross country mill with six two-high nonreversing 12-in. stands in staggered arrangement and 250-ft. hot-bed with shears; features of mill. (W23d, W20, 1-2; ST)

388-W. Electrical Features of a Hot Strip Reversing Rougher With Close Coupled Edger. J. H. Greiner and A. Mozina. *Iron and Steel Engineer,* v. 34, July 1957, p. 88-93.

Electrical drive and control equipment of four-high rougher with close coupled vertical edger using automatic preset screwdown control on both main mill and edger for positioning screwdown and side guides. (W23n, 1-2)

389-W. Open Hearth Furnaces. Keith D. Bartels. Paper from "Symposium on High Temperature Refractories." *Iron and Steel Engineer,* v. 34, July 1957, p. 106-109.

Problems encountered with refractories and advantages of higher quality brick in openhearth construction. (W18r, RM-h)

390-W. Symposium on High Temperature Refractories. *Iron and Steel Engineer,* v. 34, July 1957, p. 106-118.

Three papers dealing with the importance of refractories in openhearth furnaces, reheat furnaces, soaking pits. Papers abstracted separately. (W18r, W20g, W20h; RM-h)

391-W. Reheat Furnaces. Edward E. Callinan. Paper from "Symposium on High Temperature Refractories." *Iron and Steel Engineer,* v. 34, July 1957, p. 109-115.

Problems and experiences with refractories in curtain wall of rotary hearth plate metal furnace and spalling and other problems with roof refractories in strip mill furnace. (W20h, 1-2; RM-h)

392-W. Soaking Pits. E. R. Sullivan. Paper from "Symposium on High Temperature Refractories." *Iron and Steel Engineer,* v. 34, July 1957, p. 115-118.

Difficulties and practices in regard to refractories in soaking pit walls and covers, regenerator roof, bulkhead walls and checker walls. (W20g; RM-h)

393-W. Mold for Titanium Casting. F. W. Wood and R. P. Adams. *Light Metal Age,* v. 15, Aug. 1957, p. 18-20. (CMA)

Skull arc casting of titanium and its alloys is about to become commercial after the development work of the Bureau of Mines. Mold materials are the main problem. Machined graphite molds have been developed which give good detail and may be reused several times. (W19g, 1-2, E10r; Ti)

394-W. Foundry Equipment—No. 1500 Automatic Shell Core Blowing Machine. *Machinery,* v. 91, Aug. 23, 1957, p. 417-419.

New automatic shell core blowing machine produces a shell core of simple cylindrical shape every 15 sec. Six core boxes, carried by an indexing drum, pass through the investment, curing, stripping and cleaning operations automatically and the completed cores emerge from the machine on a conveyor belt. (W19h, 1-2)

395-W. Quenching Oils. *Mechanical World and Engineering Record,* v. 137, Aug. 1957, p. 372-373.

Disadvantages of organic oils from standpoint of oxidation and formation of metallic soaps. Properties of mineral oil as quenching medium. Formula of required quenching medium per amount of work. (W28p; NM-h)

396-W. Furnaces for Annealing and Degassing of Titanium. C. E. Peck. *Metal Treating,* v. 8, July-Aug. 1957, p. 2-3. (CMA)

Special furnaces are required to provide inert atmosphere in annealing and degassing titanium. Retorts of vacuum furnaces are usually cylindrical and may be mounted in various ways. Pumping vacuum between the chamber wall and the retort prolongs the retort life. The Kold-Retort and the Mallory-Sharon type vacuum furnaces are described, and advantages of each are noted. (W27, 1-23, J23, 1-2; Ti)

397-W. Precision Control of Hydraulic Forging Presses. F. H. Towler and B. C. Wilkins. *Metal Treatment and Drop Forging,* v. 24, June 1957, p. 217-222.

Analysis of factors affecting depth of penetration for hydraulic forging presses; problems in limiting press stroke by positive stop, cutoff valves and other methods. (W22p)

398-W. Steels for Pressure Die Casting Dies. K. I. Bengtsson. *Metal Treatment and Drop Forging,* v. 24, June 1957, p. 227-236.

Thermal stresses in die casting dies; effects of alloying elements on mechanical and physical properties of steel and its resistance to corrosive action of alloy being cast; high-temperature tensile properties of some typical die steels.
(W19n, 17-7, Q general, R6m; ST)

399-W. Method Study Leads to Product Redesign. Norman Bashford and Dennis Meredith. *Metalworking Production,* v. 101, July 19, 1957, p. 1231-1236.

Scrap metal baling press and its redesign. (W12s, 1-2; RM-p)

400-W. For Heat Treating Big Titanium Sheets. *Modern Metals,* v. 13, Aug. 1957, p. 56. (CMA)

The vacuum heat treating furnace installed by North American Aviation at Downey, Calif., can be used to degas titanium (at 1100-1400° F.) or to vacuum braze full-size titanium sheet. An internal tube cooling system has been built in for setting the braze on honeycomb titanium prior to moving to a cooling chamber. The furnace removes hydrogen picked up in the chemical milling of titanium. (W27, 1-23, K8j; Ti, 4-3)

401-W. (French.) **Contribution to the Study of Rolling Equipment. Pt. 1, Sec. C., Malleability and Flow of Metal During Hot Rolling.** G. Grenier. *Echo des Mines et de la Metallurgie,* no. 3501, Feb. 1957, p. 83-90.

Roll maintenance and design in relation to procurement of desired results. Analysis of open, closed and direct pressure passes. (To be continued.) (W23, 1-2, Q23q)

402-W. (French.) **Contribution to the Study of Rolling Equipment. Pt. 1, Sec. C. (Continued.) Malleability and Flow of Metal During Hot Rolling.** G. Grenier. *Echo des Mines et de la Metallurgie,* no. 3502, Mar. 1957, p. 153-156.

Analysis of indirect pressure passes, widening passes and inclined passes. (To be continued.)
(W23, 1-2, Q23q)

403-W. (French.) **The Hot Blast Cupola. A Simple New Method of Recuperating Heat for Heating the Blast.** Georges Ulmer. *Fonderie,* no. 138, July 1957, p. 287-302.

Device has been developed at Centre Technique des Industries de la Fonderie (Casting Industries Technical Center) which makes it possible to pre-heat blast to 400° C. Experimental installation, operation and results. 11 ref. (W18d, 1-2)

404-W. (French.) **New Machine for Preparation of Foundry Sand.** W. Geil. *Fonderie Belge,* Apr. 1957, p. 73-76.

Characteristics and operation of an alternating mixer-malaxator designed for treatment of molding sands. (W19h, 1-2)

405-W. (French.) **High Frequency Ovens for Core Baking and Up-to-Date Organization of Coremaking.** Pierre Fraison. *Fonderie Belge,* no. 78, July-Aug. 1957, p. 175-180.

Behavior of a core in a high-frequency oven; design of such ovens and their advantages; organization of coremaking with modern equipment. (W19k, E19, 1-2)

406-W. (French.) **Conveyor Belts of Bare or Rubber-Coated Steel.** *Revue de l'Industries Minerale,* v. 39, May 1957, p. 437-440.

Sandvik (Sweden) has developed steel belt with two layers of rubber vulcanized on for use in mining industry and others where abrasive materials are handled. Engineering details, installations.
(W12r, T28q, 1-2, L26r; ST)

407-W. (German.) **Signalling Equipment for Controlling the Flow of Ma-**

terials in Steel Works. Hermann-Ernst von König. *Stahl und Eisen,* v. 77, Aug. 8, 1957, p. 1081-1089.

Flow of materials and telecommunication systems; signalling equipment of the basic converter steel plant; signalling system for the flow of materials to the blooming-slabbing mill; light letters and signs, crane signals and indicating table for the charging of pit-furnaces and ingot signals.
(W10, X15, 1-2; ST)

408-W. (Italian.) **Industrial Frequency Induction Melting Furnaces.** Lelio Orsini. *Fonderia,* v. 6, June 1957, p. 269-273.

Types, sizes, uses, operation, accessories, electrical specification, etc., of these furnaces.
(W18a, E10, 1-2)

409-W. (Italian.) **Exothermic Products and Protective Varnishes.** G. Zigiotti. *Fonderia Italiana,* v. 6, Mar. 1957, p. 117-118.

Utility of thermogenic products in foundries; protective varnishes for molds and cores; prerequisites of a good varnish; composition of most commonly used varnishes.
(W19g, 1-2)

410-W. Development of Controlled Air Distribution Furnace. J. M. Stapleton. *Blast Furnace and Steel Plant,* v. 45, Sept. 1957, p. 1007-1017.

Dry blast and wet blast; tuyere design; lining performance; measurement of air flow to the tuyeres by taking piston tube traverse readings of blow stock; computation of actual velocities and volume of blast; design and function of an air proportioning system. (W17g, 1-2)

411-W. Simple, Low Cost Methods for Controlling Weld Faults. J. E. Sangster. *Canadian Metalworking,* v. 20, Aug. 1957, p. 48-52.

Precautions in electrode selection, pre-treatment, fitup and inspection during and after welding for reducing weld defects.
(W29h, 1-2, S general)

412-W. High-Frequency Melting for Research. *Electrical Times,* v. 132, Aug. 15, 1957, p. 229-230.

Installation consists of 200-kw. motor generator and ancillary equipment and four conventional furnaces. Schematic arrangement of main circuits of furnace installation.
(W18a, 1-2)

413-W. UK's Largest Roll Housing. *Foundry Trade Journal,* v. 103, Aug. 29, 1957, p. 259-261.

Heaviest rolling-mill housing to be made in Great Britian was recently cast by English Steel Castings Corp., Ltd. Housing took 700 hr. to mold, some 250 tons of liquid steel being poured in 26 min. Casting took three weeks to cool before stripping, with a further 800 hr. devoted to fettling and cleaning.
(W23m, 17-7, E-11; ST)

414-W. Knock-Out Ventilation in the Foundry. W. D. Bamford, F. R. Wilson and J. Bright. *Institution of Heating and Ventilating Engineers, Journal,* v. 25, Aug. 1957, p. 113-125.

Design of a side-draught ventilating system for a foundry knock-out unit, and the steps taken to coordinate the movement of molds and castings with the requirements of this ventilating system.
(W10d, E general)

415-W. Hydraulic Equipment in Steelworks. Pt. 3. Application and Experience in a Cold-Rolling Mill. F. E. C. Probyn. *Iron and Coal Trades Review,* v. 175, Aug. 9, 1957, p. 307-313.

Problems with leakage, valves, hose connections, and pumps; modern trends in application of hydraulic equipment.
(W10, W13, W23, 1-2, 1-20)

416-W. Design of Die-Castings. Pt. II. The Influence of the Rigid Die. H. K. Barton. *Metal Industry,* v. 91, Aug. 16, 1957, p. 125-127.

Gives normal drafts and papers for cores and diecasting wall for die casting tin, lead, zinc, aluminum, magnesium or copper alloys; movable cores, separate sliding block and other devices to meet requirements for casting different shapes. (To be concluded.) (W19n, 1-2, 17-1)

417-W. Design of Die-Castings. Pt. II. The Influence of the Rigid Die. H. K. Barton. *Metal Industry,* v. 91, Aug. 23, 1957, p. 151-152.

Discusses moving core and die parts, in die casting die closure and effect of die design on dimensional tolerances. (W19n, 1-2, 17-1)

418-W. Special Steels for Turbine Generators. Charles Sykes. *Metal Progress,* v. 72, Sept. 1957, p. 200, 206-207, 210. (Digest from "The Special Steelmaker and Power Generation", Fifth Harold Wright Lecture, Cleveland Scientific and Technical Institution, Middlesbrough, England, Nov. 29, 1956, 35 p.)

Summary of the alloy steels used by the English turbine-generator builders coupled with a good description of some of the metallurgical problems that arise in producing these special steels. (W11q, 17-7; AY)

419-W. Development of the Hydrocyclone. Stephen E. Erickson. Paper from "Symposium on Cyclones." *Mining Engineering,* v. 9, Aug. 1957, p. 869-872.

Size, shape and details of cyclones from early dust collector types to current designs for desliming, classification or thickening of minerals. (W15p, 1-2)

420-W. Selecting a Cyclone for Wet Classification. E. C. Herkenhoff. Paper from "Symposium on Cyclones." *Mining Engineering,* v. 9, Aug. 1957, p. 873-876.

Factors to consider include tonnage rate to be treated, open or closed circuit, overflow or underflow of value, subsequent treatment, mesh of separation desired; limitations of dilution, specific gravity, composition, shape and size range of feed particles, nature of suspension liquid, variations in feed volume, control desired and pulp temperature. (W15p, B13c, 1-2)

421-W. Metallizing Ovens Require Process Know-How. Herman G. Gehrich. *New York Industrial World,* v. 2, Aug. 1957, p. 12-14.

Production flexibility was a basic consideration in the design of these gas-fired ovens that may be called on to process plastic, metal or glass during the same day. (W4k, L23, 1-2)

422-W. Tool Steels. Pt. 4. Selection of Materials for Hot Work Applications. L. F. Spencer. *Steel Processing and Conversion,* v. 43, Aug. 1957, p. 447-455, 469, 472.

Chemical composition, hardness, microstructure, special properties and heat treating conditions for a variety of toolsteels useful in hot work applications; includes steel for die casting dies, hot forging dies, dies for hot extrusion and accessory equipment applications. 10 ref. (W19n, W22a, W24n, 17-7; TS)

423-W. The Best Power Source for Automatic Wire Feed? L. P. Henderson. *Welding Engineer,* v. 42, Sept. 1957, p. 34-35.

Relative advantages of constant current, variable voltage-variable current and constant voltage control system and characteristics and advantages of each, for control of wire feed in automatic arc welding. (W29a, K1, 1-2)

424-W. Electrode Control in an Alloy Pressure-Vessel Plant. W. W. Weber. *Welding Journal,* v. 36, Aug. 1957, p. 798-801.

Handling regulations and control of electrodes to insure quality welds. (W29h, 1-2)

425-W. (German.) **Modern Cupola Practice.** H. Anders. *Giesserei-Praxis,* v. 75, Aug. 10, 1957, p. 319-322.

Importance of the use of the right type of furnace in foundries; design and operation of some modern equipment. (W18d, 1-2)

426-W. (German.) **Are Hot Blast Cupola Furnaces in Iron Foundries Economical?** Hans Reininger. *Giesserei-Praxis,* v. 75, Aug. 10, 1957, p.327-334.

Description of hot blast cupola furnace design, operation and development; comparison with cold blast furnace shows the hot blast superior technically, metallurgically and economically; data in tabular form are given for both types on 11 important cost characteristics. (W18d, 1-2; CI)

427-W. (German.) **Multiple-Roll Cold Rolling Stands.** Georg Thiel. *Zeitschrift für Metallkunde,* v. 48, July 1957, p. 399-403.

The development of cold rolling stands as designed by W. Rohn and the design features of modern equipment. Possible applications and practical results. Advantages over common rolling stands used up to present time. (W23f, 1-2)

428-W. (Japanese.) **The Welding Rod and Its Selection.** Ko Nakayama. *Metals,* v. 27, Aug. 1957, p. 603-607.

Characteristics of the iron powder type welding rod, its efficiency and mechanical properties. (W29h, 17-7; Fe)

429-W. (Russian.) **Charging of Raw Materials Into the Blast Furnace Skips by Belt Conveyors.** N. S. Fill & I. S. Lemberikman. *Stal',* v. 17, June 1957, p. 493-495.

Plea for the replacement by belt conveyers of the scale-cars and subsequently, of the skip charging of raw materials. Testing of this new system of burden charging is particularly essential in connection with the forthcoming construction of super-high capacity blast furnaces. (W12r, DI, 1-2)

430-W. New Nodular Cast Iron Welding Rod for Foundries and Fabricators. R. O. Day, J. S. Snyder and H. V. Inskeep. *Welding Journal,* v. 36, Sept. 1957, p. 410s-414s.

Use of a nodular iron as a filler metal yields a fully nodular deposit with reasonable ductility using oxy-acetylene welding method. Deposits made with this rod by means of the gas-shielded tungsten-arc method are also nodular and of good quality. (W29h, 1-2, 17-7; CI-r)

431-W. (Czech.) **Dynamics of Feeding Devices for Pilger Rolls.** Antonin Cermak. *Hutnicke Listy,* v. 12, no. 2, 1957, p. 116-125.

A graphical investigation of dynamics of feeding in the rolling of tubes on pilger rolls; importance of curves of dynamic and kinematic factors in instant of meshing puddle bars with rolls when feeding action is changed into reciprocating motion caused by rolling; curves of track speed and time. (W23h, 1-2)

432-W. (French.) **Ultrasonics. Industrial Applications. Pt. 2.** P. Hemardinquer. *Pratique des Industries Mecaniques,* v. 43, July 1957, p. 177-182.

Applications to welding and galvanizing of light alloys; ultrasonic soldering irons; foundry applications. (W general, 1-24)

433-W. (French.) **Duplex Furnace for Electrolytic Refining of Aluminum.** Louis Ferrand. *Revue Generale de l'Electriciate,* v. 66, July 1957, p. 361-373.

Two operations are carried out simultaneously in a single furnace; primary electrolysis provides raw material which serves as liquid cathode in center crucible; electrolytic refining of raw metal takes place in lateral crucibles. Design of channels connecting crucibles includes cooled segregation chamber which permits separation by crystallization of impurities from bottom layer of metal. 44 ref. (W18e, 1-2; Al)

434-W. (Spanish.) **The Electrode and Its Coating.** *Fusion de Metales,* v. 19, July-Aug. 1957, p. 15-18.

Types, function, composition of coatings; explanation of electrode code designations. (W29h, 1-2)

435-W. The Hot Strip Mill at Hagfors. W. Bengtson. *ASEA Journal,* v. 30, 1957, p. 51-64.

Semicontinuous hot strip mill for strip gages up to about 440 mm., operating at close tolerances and reduced manpower. 2 ref. (W23c, 1-16; ST)

436-W. Progress at Ravenscraig. *Iron and Coal Trades Review,* v. 175, Aug. 16, 1957, p. 365-372.

Ravenscraig steelworks of Colville group includes 70 Becker type combination gas guncoke ovens, sulphate of ammonia plant, benzole plant, 1000 tons per day all welded blast furnace, ancillary equipment, power station and melting shop. (W10, 1-2; ST, Fe)

437-W. Add Life, Cut Cares, Use Carbon Refractories in Cupola Construction. G. B. Tatum. *Modern Castings,* v. 32, Oct. 1957, p. 58-64.

Carbon blocks used for lining cupola wells, tapholes and slagging troughs resist attack from acid and basic slags and have high strength at elevated temperatures. (W18d, 1-2; RM-h39)

438-W. Russian Basic Roof Experience. *Iron & Steel,* v. 30, Sept. 1957, p. 429-434.

Based on experiences of various plants forming the Inter-Works School, recommendations are given for furnace design, thermal conditions and maintenance. (W18r, 1-2; ST, RM-h)

439-W. Induction Heating for Merchant Mill. R. S. Segsworth. *Metal Progress,* v. 72, Oct. 1957, p. 129-132.

Billet-sized ingots are pushed end to end through a long induction coil, the first half of which receives 60-cycle current and the second half 540-cycle current. A 6½-in. square reaches rolling temperature in 8.4 min. Indicated scale loss of 3% in oil-fired heaters has been reduced to less than 1%. (W20h; 1-19; CN)

440-W. The Phoenix Hydro-Cyclone. Philip Rabone. *South African Institute of Mining and Metallurgy, Journal,* v. 52, July 1957, p. 724-732.

Development of low-velocity open-top cyclone with adjustable vortex pipe and flexible rubber inlet and underflow-discharge nozzles. Models with both conical and cylindrical skirts are in successful operation. Overflow product can be varied while cyclone is in operation. Ease of adjustment, low wear and freedom from choking are claimed. A simple adaptation of vortex pipe has enabled cyclone to be used for thickening. (W15, 1-2; Au)

441-W. Al Alloy Variety Spurs Use in Exchangers. R. W. Flournoy.

Chemical Engineering, v. 64, Oct. 1957, p. 318-324.

Multiplicity of aluminum alloys, including new high-strength alloys, gives wide choice of properties, equipment designs, for process heat exchangers. 7 ref. (W13b, 17-7; Al)

442-W. Continuous High Speed Heating and Rolling of Copper Cakes. E. W. Weaver. *Industrial Heating*, v. 24, Oct. 1957, p. 1996-2004.

An automatically operated pusher-type high-speed cake heating furnace, utilizing controlled atmosphere. (W20h, F23, 1-2, 1-11; Cu)

443-W. Alloy Fans in Heat Treating Furnaces Have Long Service Life at 1600-1800° F. *Industrial Heating*, v. 24, Oct. 1957, p. 2066-2068.

(W27p, 17-7; SGA-h)

444-W. Infrared Oven Used for Dynamic Etching Process. William L. Timm. *Industrial Heating*, v. 24, Oct. 1957, p. 2104-2108.

Oven provides a semi-mild cure to masking prior to etching process. (W4k, 1-2)

445-W. How to Select a Vacuum Arc Furnace. L. L. Johnson. *Iron Age*, v. 180, Oct. 3, 1957, p. 96-99.

Criteria for furnace selection. (W18, W27, 1-23, 1-2)

446-W. Algoma's Combination Bar and Strip Mill. W. H. Mulflur. *Iron and Steel Engineer*, v. 34, Oct. 1957, p. 73-82.

A 30-in. combination mill uses interchangeable stands on the same mill shoes and on the same pass line allowing for great flexibility. (W23c, W23d, 1-2; ST)

447-W. New Merchant and Bar Mill Has Improved Lubrication System. *Iron and Steel Engineer*, v. 34, Oct. 1957, p. 137-138.

Three special-built mill lubrication systems feed approximately 475 gpm. of extreme pressure oil of various viscosities to gears and bearings on drives at Atlantic Steel Co. (W23m, 1-2, 18-23; ST)

448-W. Multiple Strip Processing Gains in Popularity. E. F. Boening. *Iron and Steel Engineer*, v. 34, Oct. 1957, p. 146.

Two-strand anneal and pickle line is being erected in an eastern steel mill by Allis-Chalmers Manufacturing Co. (W23c; ST)

449-W. Aluminium Foil Production. *Metal Industry*, v. 91, Oct. 4, 1957, p. 296-297.

Four new mills at Venesta Ltd., Silvertown, England, weigh 60 tons each and their combined output is about 3500 lb. of foil per hr. (W23, 1-2; Al, 4-6)

450-W. Three Steps to Profitable Use of Molding Machines. J. M. Leaman and D. C. Ekey. *Modern Castings*, v. 32, Nov. 1957, p. 41-48.

Functions, mechanical actions, relation to foundry layout and selection of molding machines. (W19h, 1-2)

451-W. Best Automatic D-C Source? J. H. Headapohl, Robert A. Wilson and George G. Glenn. *Welding Engineer*, v. 42, Oct. 1957, p. 34-38.

Opinions on advantages and limitations of constant voltage power, variable voltage or constant voltage rectifier as power sources for automatic arc welding. (W29a, K1, 1-2)

452-W. Electrical Requirements for Automation in Arc Welding. R. W. Tuthill and R. D. Mann. *Welding Journal*, v. 36, Oct. 1957, p. 980-985.

Low voltage power supplies and high current density make it possible to use simplified wire-feeding systems. (W29b, K1, 1-2)

453-W. (French.) **Contribution to the Study of Rolling Mill Equipment. Pt. 2. Equipment for Rolling Semi-Finished Products.** G. Grenier. *Echo des Mines et de la Metallurgie*, v. 3507, Aug. 1957, p. 461-464.

Description of blooming mills at Gary Works of Indiana Steel, Jones & Laughlin Aliquippa Works, American Rolling Mill Middletown Works, U. S. Steel Templeborough Works (England), Bethlehem Steel Sparrows Point Works. (To be continued.) (W23a, 1-2)

454-W. (French.) **No. 2 Blast Furnace at Société Métallurgique de Knutange.** Max Brun. *Technique Moderne*, v. 49, July 1957, p. 330-331.

Description of furnace lighted in 1953, in trouble-free operation since, averaging 14,000 tons per month production. (W17g, 1-2)

455-W. (French.) **Control and Regulation of Fuel Oil Fired Martin Furnaces.** F. Bourdillon. *Technique Moderne*, v. 49, July 1957, p. 338-340.

Examination of particular case involving tilting furnace with basic vault, pouring 160 tons of steel per melt; fuel is No. 2 heavy oil attaining temperature of 100-120° C. in burner; fuel sprayed by compressed air or steam at 10 kg. per sq. cm.; control and regulation of fluid deliveries, pressures and com-

bustion, and pyrometric controls. (W18r, S18, S16)

456-W. (French.) **Arc Melting Furnaces for Steel.** R. Boutigny and C. Barbaanges. *Technique Moderne,* v. 49, July 1957, p. 341-348.

Development of arc furnaces and use in various countries; characteristics; manufacture of steel in arc furnaces and new techniques (use of oxygen, temperature and analysis control, electromagnetic stirring, gas removal) available to steelmakers; Martin furnace and electric furnace cost comparison. 6 ref. (W18s, D5, 1-2; ST)

457-W. (French.) **Continuous Wire Mill at Wendell Plant in Joeuf.** J. Boulange and M. Biau. *Technique Moderne,* v. 49, July 1957, p. 351-353.

Brief comparison of new and old type wiredrawing equipment. Description of mill at Wendell plant, including electrical equipment and coiler controls. (W24k, 1-2)

458-W. (French.) **Société Métallurgique de Normandy's Continuous Wire Mill.** L. Boulez. *Technique Moderne,* v. 49, July 1957, p. 354-357.

General description of equipment put into service in 1951, now producing some 200,000 tons of wire per year, 75 to 80% of which is in small sizes. (W24k, 1-2)

459-W. (French.) **Iron Mill of Sidélor Works at Homécourt.** M. Simon. *Technique Moderne,* v. 49, July 1957, p. 358-360.

Entirely mechanized, continuous 7-stand blooming mill, 6-stand zigzag finishing mill, coilers, cooler, storing area, loading equipment. Rolls bars and rounds; tooling for angle-iron in preparation. (W23, 1-2; ST)

460-W. (French.) **Reheating of Ingots in Soaking Pits.** *Technique Moderne,* v. 49, July 1957, p. 366-369.

Types of soaking pits; maintenance of covers; heat recuperators; control and regulation; refractories and maintenance; reheating time and calory consumption; electric soaking pits. (W20g, 1-2)

461-W. (French.) **Role of Mechanization in the 720 Sheet Rolling Mill.** G. Liégeois. *Technique Moderne,* v. 49, p. 370-374.

Mechanized aspects of conveyers, roll stands, speed controls of continuous mill at Rehon plant in Provence, in operation since 1951. hot rolling all types of steel strip from 100 to 600 mm. wide by 1.25 to 7 mm. thick. (W23c, 1-2, 18-24)

462-W. (French.) **Usinor's Montataire Works: Continuous Pickling Line, New Four-Stand Rolling Mill, Annealing, Skin Pass.** M. Mallet. *Technique Moderne,* v. 49, July 1957, p. 375-381.

In 1950 Usinor installed first continuous cold rolling mill for thin strip in France. Description and operating details. (W23f, 1-2)

463-W. (French.) **Sendzimer Cold Rolling Mill in Isberques Works of Compagnie des Forges de Chatillon: Electrical Equipment.** J. L. Ceyrac. *Technique Moderne,* v. 49, July 1957, p. 383-390.

Description of electrical equipment and its role in simplifying regulation of rolling operations. (W23f, W23n, 1-2)

464-W. (French.) **Mechanized Mills for Rolling Thin Sheet.** V. Charet. *Technique Moderne,* v. 49, July 1957, p. 393-394.

Hot rolling of 2.5 to 0.4-mm. sheet from billets. Roughing and finishing stands, pre-heating furnaces. (W23c, 1-2)

465-W. (French.) **S.A.F.E.'s Reversible Quarto Train, Annealing and Duo Skin Pass.** M. Jobard. *Technique Moderne,* v. 49, July 1957, p. 396-398.

Cold rolling of thin sheet at S.A.F.E. plant in Hagondange. Equipment and operating details. (W23c, 1-2)

466-W. (French.) **New Rolling Mill at Longwy Works of Société Lorraine-Escaut.** J. Friry. *Technique Moderne,* v. 49, July 1957, p. 402-406.

General layout; electrical equipment and pit furnaces. (W23, 1-2)

467-W. (French.) **Annealing Furnaces for Steel.** *Technique Moderne,* v. 49, July 1957, p. 416-418.

Description of removable hearth or removable hearth and top furnaces, bell furnaces, continuous furnaces, roller furnaces; applications of each type. (W27, J23, 1-2; ST)

468-W. (French.) **Auxiliary Equipment for Steel Furnaces.** R. Petitjean. *Technique Moderne,* v. 49, July 1957, p. 425-430.

Equipment for raw material preparation and transport to furnace; for charging and tapping; for handling pouring ladles and assuring evacuation of processed materials. (W12, W18, 1-2; ST)

469-W. (French.) **Finishing Equipment Used in the Rolling of Steel.** E. Goue. *Technique Moderne,* v. 49, July 1957, p. 431-433.

Equipment for finish rolling of shapes, rounds and flat products. (W23q, 1-2; ST)

470-W. (French.) **Recent Improvements in Equipment for Rolling Heavy Plate.** J. Charles. *Technique Moderne,* v. 49, July 1957, p. 434-436.

New equipment developed by Societe Moeller et Neumann: hot straightener, roller-type cooler with turn-over device to permit surface inspection, shearing line. (W23b, 1-2)

471-W. (German.) **Choice of Steels for Pressure Casting Dies.** Herbert Briefs. *Giesserei,* v. 44, Sept. 26, 1957, p. 588-593.

Grouping of the hardenable hot working steels according to alloy content and performance; development and present state of the die steels used; comparison between the air hardening chromium-molybdenum steels and the 5% tungsten steel in behavior in tempering in the tensile test at elevated temperatures and in elongation; possibilities of increasing the efficiency of dies made of conventional steels. 8 ref. (W19n, 17-7; TS-k)

472-W. (Italian.) **Induction Forehearth and the Induction Mixer in the Modernization of Cast Iron Foundries.** A. Tagliaferri. *Fonderia,* v. 6, Aug. 1957, p. 337-340.

Low-frequency induction equipment. Ease and economy of operation, excellent metallurgical control afforded. Installations in Italy, France, Mexico, and Spain. (W18a, 1-2; CI)

473-W. (Russian.) **Configuration of Ingot Bottoms.** L. B. Andreyuk. *Stal',* v. 17, Jan. 1957, p. 35-38.

Cropping scrap was reduced by the addition of a bottom plate with spherical holes and by changing the shape of the mold bottom. (W19c, 1-2; ST)

474-W. (Russian.) **Use and Repair of 200-Ton Ladles.** V. I. Morozov and M. T. Burnaev. *Stal',* v. 17, Jan. 1957, p. 38-42.

The capacity of ladles was increased by appropriate design to enable them to handle the growing production of openhearth furnaces. Their utilization was improved by mechanization of maintenance and repair. (W19b, 1-2; ST)

475-W. (Russian.) **Increasing the Productivity of No. 2 Blooming Mill.** V. P. Kozhevnikov, A. M. Uzienko, G. G. Kustobaev, G. V. Saveliev and F. P. Skachko. *Stal',* vol. 17, Jan. 1957, p. 47-52.

Production of blooming mill was increased 86.5% while scrap was reduced from 0.32 to 0.13% by reconstruction and by introduction of automation. (W23a, 1-2, 18-24; ST)

476-W. (Russian.) **Results of Modernizing No. 3 Blooming Mill in Magnitogorsk.** L. V. Andreyuk. *Stal',* v. 17, Jan. 1957, p. 53-59.

By adding a reversing stand, lengthening the receiving table and increasing the speed of the ingot buggy, production was increased 8.5—47.0% according to the shape rolled. The extent of modernization was limited mainly by available heating capacity. (W23a, 1-2; ST)

477-W. (Russian.) **Durability of Steel Ingot Molds.** C. M. Bobrovskikh and A. G. Nikolaev. *Stal',* v. 17, Jan. 1957, p. 84-88.

The life of ingot molds may be considerably increased by proper chemical composition, correct design, effect of cooling, their position on the ingot cars and control of pouring. (W19c, 17-7, 1-2; ST)

478-W. (Russian.) **Tasks of Machine Building Industry in Developing Equipment for Openhearths.** V. A. Brandt. *Stal',* v. 17, Feb. 1957, p. 119-124.

Requirements for the sixth five-year plan. Complete mechanization is urged with utilization of most up-to-date heavy duty equipment. 4 ref. (W18r, 1-2)

479-W. (Russian.) **Conversion of Oil-Fired Openhearth Furnaces to Natural Gas Heating.** V. P. Borodin, P. E. Darmanyan, I. A. Yudson and L. S. Shevandina. *Stal',* v. 17, Feb. 1957, p. 124-129.

Natural gas was proven to be cheaper than crude oil, and due to the absence of sulphur, a better grade of steel can be produced. Performance of the two firing systems compared. (W18r, 1-2, RM-m35, ST)

480-W. (Russian.) **Effect of the Hot Top Shape on the Macrostructure of Ingots.** A. K. Petrov and B. P. Okhrimovich. *Stal',* v. 17, Feb. 1957, p. 130-135.

A new hot top mold was developed with di-angular draft in its walls and a broadened base which leaves the top of the ingot mold partially exposed. The solidifying ingot hangs on this shelf. The pouring gate is easily removed because no crust is formed at the joint, and at the same time the macrostructure of the ingot is improved. 4 ref. (W19c, D9k, M28; ST, 5-9)

481-W. (Russian.) **Strain and Energy Indicators on Blooming Mill Rolls.** T. M. Golubev, L. N. Soroko, M. A. Zaikov, M. P. Kaftanov, N. A. Chelyshev, G. A. Sakharov and B. P. Zuev. *Stal'*, v. 17, Feb. 1957, p. 141-146.

The loading of the motor was correlated with the strain in the principal parts of the mill. It was found that production could be increased, rolling pass time reduced and idle time minimized after strengthening certain parts of the mill. (W23a, W23n, 1-2)

482-W. (Russian.) **Cooling System of Openhearth Furnaces.** A. P. Mamet, A. V. Nikolaev and A. I. Kabanova. *Stal'*, v. 17, Feb. 1957, p. 173-178.

By examining water under operating conditions and subjecting the cooling system to thermochemical tests, tentative standards were worked out for steam and water requirements. (W18r, 1-2; ST)

483-W. (Russian.) **Design of Skip Hoists of Blast Furnaces.** I. P. Prikhodko and B. A. Levshin. *Stal'*, v. 17, No. 7, July 1957, p. 584-586.

Critique of the method published by Ya. F. Cheltsov and G. A. Dubrovin in *Stal'*, No. 6, 1956. Detailed discussion of the design principles of the blast furnace skip hoist. 2 ref. (W12b, D1a, 1-2)

484-W. (Russian.) **140, 250 and 400-Mm. Soviet Tube Rolling Mills.** A. S. Grishkan, M. Ya. Krichevskii, G. K. Seifulin and N. B. Rozenfeld. *Stal'*, v. 17, July 1957, p. 621-627.

Improved tube rolling mill characteristics and design. The mills can produce tubes with much more accurate dimensions at a great saving of metal. Thin-walled tubes can also be made using 400-mm. mill. 2 ref. (W23h, 1-2)

485-W. (Russian.) **Cooling of Openhearth Furnaces by Evaporation.** S. I. Moiseevich. *Stal'*, v. 17, July 1957, p. 658-662.

General discussion of openhearth furnace cooling by evaporation of water and utilization of steam for electric power production.
(W18r, W11; ST)

486-W. (German.) **Development of Ball and Roller Bearings for the Rolling Mill.** Günter Strafe. *Stahl und Eisen*, v. 77, Sept. 19, 1957, p. 1315-1329.

Characteristics of ball and rolling mill bearings; friction losses, maintenance and lubrication; application in different types of mill stands. 8 ref. (W23M, 18-21, 18-23)

SECTION X

INSTRUMENTATION

Laboratory and Control Equipment

1-X. (Russian.) **Dilatometer for the Study of Phase Transformations in Alloys.** V. G. Permiakov and M. V. Belous. *Zavodskaia Laboratoriia,* v. 22, no. 10, Oct. 1956, p. 1251-1252.

Design, operation and degree of accuracy of device for laboratory determinations of coefficients of linear expansion and phase transformations. (X24, N6; AY)

2-X. Acidity Control in Zinc Electrolysis. Georg Steintveit. *Journal of Metals,* v. 8, Nov. 1956, p. 1542-1543.

The acidity control instrument described may be used as a time-saving control method in any industry where a simple relation exists between conductivity of an electrolyte and the concentration of one of its constituents. (X25; Zn)

3-X. Climbing Peel Test for Strength of Adhesive Bonds. Fred Werren and H. W. Eickner. *Modern Plastics,* v. 34, Dec. 1956, p. 187-188, 190, 264.

Apparatus is applied to the testing of aircraft sandwich materials with thin facings. (X29, 7-8)

4-X. (German.) **Mixing Calorimeter for Measurement of Metallic Mixed Phase Enthalpies Between 25 and 1000° C.** Franz Eberhard Wittig and Georg Böhm. *Zeitschrift für Metallkunde,* v. 47, no. 10, Oct. 1956, p. 699-704.

A calorimeter which automatically drops the specimens into the bath is described. (X24, P12r)

5-X. (German.) **Measuring Temperature in the Basic Converter.** Helmut Knüppel, Karl Ernst Mayer, Gert Wiethoff, Kurt Doffin and Walter Koch. *Stahl und Eisen,* v. 76, no. 22, Nov. 1, 1956, p. 1410-1416.

Apparatus and its uses, practical results. (X9, D3)

6-X. (English.) **A New Electrolytic Cell for the Isolation of Carbides and Nonmetallic Inclusions in Steel.** Nils Bäckström, Sakari Heiskanen and Urpo Ilme. *Jernkontorets Annaler,* v. 140, no. 10, 1956, p. 812-816.

General requirements, design, use. (X4; NO-a35, ST, 9-19)

7-X. Strain Gage for the Measurement of Strains in Adhesive Bonds. C. B. Norris, W. J. James and J. T. Drow. *A.S.T.M. Bulletin,* no. 218, Dec. 1956, p. 40-49.

Method for measurement of tensile strain in a thin adhesive bond between metallic adherents. (X29; NM-d34)

8-X. Super-Strong Magnets. *Chemical & Engineering News,* v. 35, Jan. 14, 1957, p. 76-78.

General Electric's new magnets will enable instruments to be made lighter and more compact. Material is composed of elongated "whiskers" of iron. (X general, 17-7, P16; SGA-n, Fe)

9-X. Raw Material Inventory Through Photogrammetry. Robert A. Cummings, Jr. *Iron and Steel Engineer,* v. 33, no. 12, Dec. 1956, p. 135-137.

Accurate raw material inventory is difficult. Method described is photogrammetry, using aerial photography, field control and third dimensional compilation. Data given for the estimation of weight of raw materials. (X5, A5, RM)

10-X. Instrumentation in the Heat-Treatment of Steel. Part I. The Nature of the Problem. W. F. Coxon. *Metal Treatment and Drop Forging,* v. 23, Dec. 1956, p. 499-502.

Necessary instruments for furnaces; atmosphere control; typical heat treatment defects. (X7, X9, J general, 9; ST)

11-X. Computers Speed Design. *Steel,* v. 139, Dec. 31, 1956, p. 61.

Computer solves mathematical problem in motor design. (X14, W25, 17-1)

12-X. Photoelectric Cells Speed Mill Production. *Steel,* v. 139, Dec. 31, 1956, p. 64, 66.

Controls length of bars and rods with great accuracy. (X10, W22, 4-5)

13-X. (Japanese.) **Design, Selection and Applications of Permanent Magnets in Communication Equipment.** Shizuo Kishi. *Metals,* v. 26, Dec. 1956, p. 923-928.

Design of permanent magnets: selection, BH point, retentivity, magnetic circuits and hysteresis curves; examples of circuits; application of permanent magnets to hand generators, receivers, magnetic bells, relays and loud speakers. 5 ref. (X15, 17-7; SGA-n)

14-X. (Japanese.) **Application and Design of Permanent Magnets as Measurement Instruments.** Sonsei Izawa. *Metals,* v. 26, Dec. 1956, p. 929-932.

Stability of permanent magnets, relationship between safety ratio and ratio of natural magnetic reduction. Design and application of permanent magnet measurement instruments. (X general, P16; SGA-n, 17-7)

15-X. An Apparatus for the Determination of Stress-Strain Properties at High Rates of Strain. R. J. MacDonald, R. L. Carlson and W. T. Lankford. *Proceedings of the Society for Experimental Stress Analysis,* v. XIV No. 1, p. 163-170.

Total strain rates ranging from ¼ to 190 in. per. min. were obtained using a 10-ton Denison hydraulic press in conjunction with a specially designed subpress. Stress-strain curves indicate the effects of a range of strain rates and temperatures on the initial yielding behavior of low carbon steel. (X29, 3-17, Q24c, 2-11)

16-X. Static and Dynamic Calibration of a Photoelastic Model Material, CR-39. A. B. J. Clark. *Proceedings of the Society for Experimental Stress Analysis,* v. XIV. No. 1. p. 195-204.

Measurements of strain and birefringence for effective loading times in the range of 10 min. and 10^{-4} sec. Two methods of determining the effective gage factor for wire resistance strain gages used on this resin. (X29, 3-17; NM-d)

17-X. Drives and Controls Forum on Technical Progress. *Steel,* v. 140, Jan. 7, 1957, p. 317-330.

Ten executives of the industry comment briefly on the new developments, some of which are punched card programming for rolling mills, design of simplified control components. (X general)

18-X. New Tape Control System for Standard Machine Tools. L. S. Peck. *Western Machinery and Steel World,* v. 47, Dec. 1956, p. 58-60.

Digital information from magnetic tapes is translated into pulse trains actuating and controlling machine tool movements, providing numerical control to small-lot production on standard machines. (X14, W25)

19-X. (German.) **Manufacture and Use of Copper-Plated Steel Telephone Line Wire of High Strength.** *Metall,* v. 10, no. 21-22, Nov. 1956, p. 1038-1041.

Characteristics and advantages in use of copper-plated steel wires for telephony. (X15, 17-7; ST, *Cu,* 8-12)

20-X. Monitor for Peak Combustion Efficiency Measures O_2 Content in Flue Gases. *Blast Furnace and Steel Plant,* v. 45, Jan. 1957, p. 86-88.

Magnetic type O_2 analyzer with probe units, electric recorder controller offers combustion control for plant boilers or steel openhearths. (X21, W18; RM-g34)

21-X. Laboratory Production of Cylindrical Alumina Crucibles of 5½ Litres Capacity. Vaughan H. Stott. *Journal of the Iron and Steel Institute,* v. 185, Jan. 1957, p. 82-85.

Details for forming the crucibles and a convenient gas furnace for firing them. (X general, B19)

22-X. TV Camera Aids Spotweld Control on Airframe Skin. Don Post. *Western Metals,* v. 15, Jan. 1957, p. 72.

TV allows spotwelder to follow quality of welds on underside of aluminum panel. (X5, K3n; Al)

23-X. Thermodynamic Analysis VII. The Dry Ice Calorimeter. Willy Oelsen, Wilhelm Tebbe and Olaf Oelsen. *Archiv für das Eisenhüttenwesen,* v. 27, Nov. 1956, p. 689-694.

Large volume change during sublimation of dry ice used to measure enthalpies. Simple and improved apparatus described. Calorimeters used to measure heat contents of metals and alloys. 14 ref. (X24, p12r)

24-X. A New Electrolytic Cell for Isolating Carbides and Nonmetallic Inclusions in Steel. N. Backstrom, Sakari Heiskanen and Urpo Ime. *Engineers Digest,* v. 17, Dec. 1956, p. 523-524. (From *Jernkontorets Annaler,* v. 140, no. 10, 1956, p. 812-816.)

Previously abstracted from original. See item 6-X, 1957.
(X4; ST, NM-a 35, 9-19)

25-X. Heavy Presses: Strain Gages Stand Guard. Leon Mollick and James Jursik. *Steel,* v. 140, Jan. 28, 1957, p. 92-93.

Self compensating hydraulic system and strain gage control system protect forging presses against dangerously large eccentric moment.
(X28, W24)

26-X. Grinding Temperatures. J. E. Mayer, Jr., and M. C. Shaw. *Lubrication Engineering,* v. 13, Jan. 1957 p. 21-27.

Apparatus for measuring the temerature of a freshly ground surface by means of a photoconducting lead sulphide cell and an oscilloscope. 21 ref. (X9, G18)

27-X. A Pneumatic Level Indicator for the Continuous Casting Process. A. G. Grimshaw and B. O. Smith. *Iron and Steel Institute, Journal,* v. 185, Feb. 1957, p. 235-237.

The pneumatic gaging principle is applied to a level indicator suitable for the continuous casting process for steel. The level indicator provides an electrical output signal which could be used to control either the rate of pouring from the tundish, or the rate of withdrawal of the ingot. (X13, D9q; ST)

28-X. (German.) **Gas Propulsion of Liquids Through Porous Powdered Metals.** W. Siemes and E. Borchers. *Chemie-Ingenieur-Technik,* v. 28, Dec. 1956, p. 783-786.

A description of filters made from powdered metals; the relationship of the size of bubbles to the size of pores and the rate of flow of water, and the loss of pressure from the bubble formation. 10 ref. (X22; 6-21)

29-X. Can "Ultrasonic Micrometers" Measure Work Being Machined? H. A. F. Rocha. *American Machinist,* v. 101, Feb. 25, 1957, p. 154-155.

Principles of ultrasonic thickness and gap measurements, future possibilities include automatic control of machining operations.
(X21, 1-24, G17)

30-X. A New Electrolytic Cell for the Isolation of Carbides and Non-Metallic Inclusions in Steel. Nils Backstrom, Sakari Heinskanen and Urpo Ilme. *Metallurgia,* v. 55, Feb. 1957, p. 101-102.

Previously abstracted from original (*Jernkontorets Annaler,* v. 140, no. 10, 1956, p. 812-816). See item 6-X, 1956.

31-X. More Steel—Less Fuel, Part I. J. R. Green. *Instrumentation,* v. 10, Jan.-Feb. 1957, p. 13-16.

Problem of adding simplification and ruggedness to industrial instruments and control systems.
(X general, 17-7)

32-X. Titanium Diaphragm Used for Telephone Receiver. K. Masuzawa and S. Magai. *Nippon Telegraph and Telephone Public Corporation, Electrical Communication Laboratory, Reports,* v. 3, Dec. 1955, p. 19-21. (CMA)

Titanium is better than duralumin as a material for a telephone receiver diaphragm. Such materials must have good tensile and creep strength, high Young's modulus and corrosion resistance, low density. Comparative test of performance and ease of manufacture described.
(X15, 17-7; Ti)

33-X. The B.I.S.R.A. Suction Pyrometer for Open-Hearth Furnace Uptakes. R. Barber, D. Meachen and W. Bateman. *Iron and Steel Institute Journal,* v. 185, Mar. 1957, p. 343-347.

A suction pyrometer, with its shield system inside the water cooled probe, is shown to give reasonable accuracy and a much improved life in the temperature range 1000-1400° C. Indicates how the accuracy and life were determined, and gives recommendations and practical hints for the use of the instrument in determining the temperatures of preheated air, particularly in open-hearth furnace uptakes. 6 ref.
(X9, D2)

34-X. Removal of Inclusions for Analysis by an Ultrasonic "Jack Hammer". George L. Kehl, Hyman Steinmetz and Warren J. McGonnagle. *Metallurgia,* v. 55, Mar. 1957, p. 151-154.

Technique and apparatus for removal of inclusions in metals for identification purposes. Inclusions with minimum diameters of 10 microns may be removed by instrument employing pointed stylus oscillating at ultrasonic frequencies.
(X4, 1-24; 9-18)

35-X. Vacuum Fusion Gas Analysis Apparatus for Use in the Quality Con-

trol of Ferrous Materials. K. Speight and G. M. Gill. *Metallurgia,* v. 55, Mar. 1957, p. 155-158.

Description of compact all-metal gas extraction system, and apparatus for analysis of the nitrogen, hydrogen and oxygen content of steel melt. (X21, 1-23; ST, *N, H, O*)

36-X. Ultrasonic Scanner and Recording System. W. N. Beck. *Nondestructive Testing,* v. 15, Jan.-Feb. 1957, p. 42-43; disc., p. 46.

Ultrasonic scanner developed at Argonne National Laboratory to handle production volume is described. (X8, 1-24)

37-X. New Drawing Die Measuring Microscope. A. Metz. *Draht (English Edition),* no. 27, Feb. 1957, p. 16-17.

Leica microscope for measuring diameter and length of parallel bore and angle of entrance cone of die for wire drawing. (X3, F28)

38-X. Russian Survey. Pt. 10. Gauge and Toolmaking in the Soviet. Peter Trippe. *Metalworking Production,* v. 101, Mar. 1, 1957, p. 355-363.

Description of Russian factories producing measuring tools, gages and optical instruments. (X20, X3)

39-X. Solving Weight and Production Problems With Mg. Robert E. Short. *Modern Castings,* v. 31, Mar. 1957, p. 53-54.

Magnesium's light weight, machinability, and its casting and drawing qualities have made possible a rugged 48-lb. military teleprinter. (X15, 17-7; Mg, 17-2)

40-X. Furnace Atmosphere Analyzers. Wayne L. Besselman. *Metal Progress,* v. 71, Apr. 1957, p. 97-103.

Rugged and precise equipment is now available for continuous measurement, recording and control of dew point, content of specific gases, total combustibles, and specific gravity of prepared furnace atmospheres. (X7, X22, J2k, 1-2)

41-X. Control of Atmosphere Converters. Walter H. Holcroft. *Metal Progress,* v. 71, Apr. 1957, p. 104-108.

Atmosphere generators are economically controlled by proportioning the relative volumes of air and fuel gas pumped into them. Exothermic generators may be simply regulated by temperature or by the combustibles in the gas. Endothermic generators are best operated at constant output, wasting any temporary excess of gas, and controlling either water or carbon dioxide content of the atmosphere. (X7, J2k, 1-2)

42-X. Controlling Atmospheres in Furnaces. Orville E. Cullen. *Metal Progress,* v. 71, Apr. 1957, p. 109-114.

Normal operating variables in atmospheres within the furnace can usually be ironed out by instrumentation controlling dew point according to time schedule (in batch-type furnaces) and by individual instruments at two or three zones controlling dew point (in continuous carburizing furnaces). (X7, J2k, 1-2)

43-X. Stress Relieving Simplified With Multipoint Temperature Recorder. Ralph M. Stotenburg. *Metal Treating,* v. 8, Mar-Apr. 1957, p. 18-20.

Twenty-four point recorder controller used with thermocouples in stress-relieving furnace permits close control and maintenance of uniform temperatures in different sections of part. (X9, J1a)

44-X. Construction and Operation of a Laboratory Scale Arc Melting Unit. J. F. Kuchta and S. Isserow. Nuclear Metals, Inc. *U.S. Atomic Energy Commission,* NMI-1142, Feb. 13, 1956, 18 p.

A unit, small enough for laboratory use, was needed for the melting of pure metals or experimental alloys requiring higher temperatures than those readily obtainable in resistance-type furnaces. The arc-melting unit was assembled for rapid melting of small specimens for various tests. The unit is flexible and has also been used for the sealing of the ends of tubes. (X24f, 1-3)

45-X. (German.) **New Controls in Melting Operations.** E. A. Hohmann. *Giesserei-Praxis,* v. 75, Feb. 25, 1957, p. 81-82.

Use of radioactive isotopes in the feeding of raw materials into the furnace to obtain a constant level. Electronic and photo-electric control circuits for furnaces are described. (X13, S18q, C5, 1-2)

46-X. A Ferrous-Inclusion Detector for Aluminum Rod. W. Frazer and M. O. Holt. *Nondestructive Testing,* v. 15, Mar-Apr. 1957, p. 96-97.

Ferrous-inclusion detector has been developed to detect inclusions of a size that may become a nuisance on the wiredrawing machine. Detector gives an audible and visual signal to the operator at the coiling end of the rod mill whenever an inclusion is detected. (X8, F27; Al, *Fe,* 9-19)

47-X. (French.) **Regulation Systems in Electric Arc Furnaces.** J. G. Robin. *Metallurgie et la Construction Mecanique,* v. 89, Apr. 1957, p. 359-363.

Importance of regulation in the electric arc furnace; various regulation systems; regulation with constant impedance; with electric control; with hydraulic control.
(X10, W17j, 1-2)

48-X. (Italian.) **Temperature Measurement and Control in Industrial Heat Treat Ovens.** Engineering Staff of ISML (Light Metals Experimental Institute). *Alluminio,* v. 26, Mar. 1957, p. 127-132.

Description and function of thermostats, heat stabilizers, thermocouples, load temperature measuring devices for heat treatment of light alloys. 8 ref. (X9, W27, 1-3; Al)

49-X. (Swedish.) **Apparatus for the Determination of Hydrogen in Steel.** Lars Bjerkerud. *Jernkontorets Annaler,* v. 141, no. 2, 1957, p. 90-94.

Main component is a quartz tube in three sections: a heater, a water coolant and a graduated burette. Heating is by high frequency coil or sliding resistance. 4 ref.
(X21, 1-2, S11; ST, *H*)

50-X. **Study of Permanent Magnets of the Barium Ferrite Type.** K. J. Sixtus. Indiana Steel Products Co. (Wright Air Development Center). *U.S. Office of Technical Services,* PB 121865, Aug. 1956, 53 p. $1.50.

More than 700 magnets were prepared and measured. Data are provided in the report for processes for making the magnets, methods and results of physical measurements, and observations on theoretical aspects of magnetism in barium ferrite. (X11g, 17-7, P16; Ba, Fe)

51-X. (Czech.) **X-Ray Monochromator for Quantitative Determination of Structural Constituents.** Frantisek Khol. *Hutnické Listy,* v. 122, Apr. 1957, p. 299-302.

Design of a simple quartz monochromator which can be used with X-ray tubes. The procedure for quantitative determination of (martensite, cementite, austenite) structural constituents in carburizing and carbonitriding layers of carbon steels is given. 8 ref.
(X3, M23, N8; CN)

52-X. (German.) **Electrolysis Tube, a New Apparatus for Metallographic Inspection.** L. G. Damgaard and E. Knuth-Winterfeldt. *Metalloberfläche,* v. 11, Mar. 1957, p. 75-76.

Apparatus for the metallographic inspection of metal surfaces on the spot. Spots up to 8 mm. diam. can be electropolished, and a replica can be taken for microscopic inspection. (X4, 1-3)

53-X. (German.) **Apparatus for Measuring the Depth of Cracks.** Lutz Brand. *Stahl und Eisen,* v. 77, May 2, 1957, p. 576-581.

Apparatus for the determination of the depth of cracks at the surface of metals with the use of direct or alternate current; calibration curves of the apparatus; variables influencing the scatter range of the curves; comparison of the measured results with the depth of cracks. (X8, 1-2, 9-22)

54-X. (German.) **How to Measure the Roughness of Technical Surfaces With Conventional Inductive Instruments.** Hugo Philipp. *Werkstatt und Betrieb,* v. 90, May 1957, p. 277-280.

New measuring arrangement for determining the surface roughness, for which purpose conventional induction instruments, measuring bridges, and registering apparatus were connected to form a functional unit. Apparatus was especially developed for measuring the roughness of gas cut surfaces, but it can also be used for other metal surfaces. (X23p, 1-3)

55-X. **Portable Thickness Gauge for Industry.** S. A. Rybb. *Canadian Metals,* v. 20, Apr. 1957, p. 66-69.

Dawe ultrasonic thickness gage works on resonance principle to major thickness of metals but only one side is accessible; surface preparation and the establishment of good contact between probe and workpiece; applications of instrument for checking wear or corrosion.
(X20c, 1-24; Q9, R11)

56-X. **Furnace Atmosphere Analyzers.** Wayne L. Besselman. *Industrial Heating,* v. 24, May 1957, p. 900-922; disc. p. 926.

Principles governing the operation of analyzers for the measurement and control of furnace and generator atmospheres are explained, including instrumentation for measuring dew point, carbon monoxide, carbon potential, total combustibles and specific gravity.
(Z7f, X7g, J2k, 1-2)

57-X. (Japanese.) **Controlling Directionality of Aluminum Sheet. Pt. 3.**

Some Industrial Methods of Detecting Directionality. Takuichi Morinaga and Shigeo Zaima. *Light Metals,* v. 7, Mar. 1957, p. 16-22.

New methods using the Knoop indentator or the Harbert pendulum on aluminum and its alloys. They are easily applicable to industrial use without special preparation of the specimen. (X23, F23; Al, 4-3)

58-X. Evaluation of Geiger Counter X-Ray Techniques for Measuring Stresses in Hardened Steels. Karl E. Beu. *American Society for Testing Materials,* Preprint 83, 1957, 8 p.

A "two exposure" X-ray Geiger counter technique for measuring residual and applied stress. A comparison of results published by other observers using similar techniques is given. 14 ref. (X2g, Q25, 1-2; ST)

59-X. Experimental Measurement of Metal-Cutting Temperature Distributions. G. S. Reichenback. *American Society of Mechanical Engineers,* Preprint No. 57-SA-53, June 1957, 15 p. $.50.

Two new methods of measuring cutting temperatures were evaluated. The first is a radiation technique using a lead-sulphide cell. The cell is arranged to sight through a small hole drilled in the work material sensing radiation from the shear plane and clearance face of the tool. The second technique uses a 0.005-in. single wire imbedded in the side of a workpiece as a thermocouple. 24 ref. (X9, 1-2, G-17)

60-X. New Microscope Shows Metals Atom Structure. Leo Seren. *Aviation Age,* v. 21, May 1957, p. 60-65.

An emission microscope which will make it easier to evaluate the structure of materials in terms of creep, fatigue, metal evaporation and radiation damage. (X3p, 1-3)

61-X. Nucleonic Thickness Gauge for Hot Steel Strip. *Process Control and Automation,* v. 4, May 1957, p. 162-165.

A version of the Baldwin nucleonic thickness gage which provides data on mean thickness of each strip, longitudinal profile and transverse profile. (X20c, F23, 1-2; ST, 4-3)

62-X. Tape Controls Inspection Machine. *Steel,* v. 140, May 27, 1957, p. 94-95.

Tape control machines automatically inspect dimensions of variety of parts. (X20, 1-2)

63-X. Thickness Control in Hot Strip Rolling. *British Steelmaker,* v. 23, May 1957, p. 138-141.

Describes installation in hot steel strip rolling mill of a thickness gage dependent on the amount of radiation transmitted through strip; uses strontium 90 and a radiation detector on opposite sides of strip with visual indicator and printed record to follow gage variation; automatically re-calibrates itself between strips. (X20c, F23, 1-16; ST, 4-3)

64-X. New Continuous Gauge. *Iron and Steel,* v. 30, May 1957, p. 171-172.

Gage for measuring hot steel strip thickness consists of radioactive source and detector with recorder and indicating units that respond to variation in strip thickness. (X20c; 4-3)

65-X. Potentionstat as a Metallographic Tool. C. Edeleanu. *Iron and Steel Institute, Journal,* v. 185, Apr. 1957, p. 482-488.

The potentionstat, an instrument which can maintain the potential of a working electrode at any desired value, is shown to be of use for controlling etching, detecting susceptibility to intercrystalline corrosion and in the study of phase diagram of hard chromium-nickel steel alloys. 10 ref. (X14, R11a, 1-3; AY, *Cr, Ni*)

66-X. Width Meter for Hot Steel Strip. C. Burns and B. O. Smith. *Iron and Steel Institute, Journal,* v. 186, June 1957, p. 218-223.

Width meter for hot rolled strip obtains readings by combining indications from two optical units sensitive to infra-red radiations from the strip, mounted several feet above the edges of strip. Experimental unit described demonstrated that width could be read to plus or minus 1/16-in., with a speed response of 0.15 sec. Commercial instruments based on principle described being manufactured. (X20, F23; ST, 4-3)

67-X. Economical Resistance-Type Controller for Platinum-Wound Furnaces. R. J. Newman. *Metallurgia,* v. 55, May 1957, p. 260-261.

Temperature controller for resistance furnaces with platinum alloy windings in which control signal is obtained by monitoring resistance of the winding; advantages and possible sources of error. (X9s, 1-2)

68-X. (French.) New Measurements of Gyromagnetic Ratios of Iron and Nickel. André J. P. Meyer and Sheldon Brown. *Journal de Physique et le Radium,* v. 18, Mar. 1957, p. 161-168.

New instrument for measuring Einstein-Haas effect; correction of precious systematic error; method of using instrument; discussion of results. 12 ref. (X26, 1-3; Fe, Ni)

69-X. An Automatic System of Fuel Control. Donald R. Mathews. *Iron and Steel Engineer,* v. 34, May 1957, p. 82-88.

Installation at steel plant for the automatic control of fuel oil and coke oven gas fuels used for heating openhearth furnaces and soaking pits.
(X13f, W18r, 1-2; RM-k 30, RM-m 38)

70-X. Cascade Temperature Control System on a Billet Heating Furnace. Jack M. Hess. *Iron and Steel Engineer,* v. 34, May 1957, p. 132-140.

Electric cascade control system automatically adjusts furnace control set point of a two-zone continuous billet furnace to make allowances for various rates of material flow; installation details and problems solved by use of control system with automatic zone setting. (X9s, W20h, 1-2)

71-X. (German.) **Control Engineering as Applied to Metallurgy.** Helmut Krüger. *Neue Hütte,* v. 2, Feb-Mar. 1957, p. 103-111.

Design of control systems; central controls, measuring and control devices. Control systems for hot blast furnaces; three-zone pusher type furnaces; openhearth furnaces; electrode control in electric furnaces; control of oxygen; conveyer control in cold rolling mills. 12 ref.
(X general, 1-2)

72-X. Graphite Resistor High-Temperature Furnace. G. E. C. Installation at B. S. A. *Metallurgia,* v. 55, May 1957, p. 255-256.

Graphite resistor furnace capable of providing temperatures up to 3000° C. for a charge up to 9 in. in diameter and 12 in. high. (X24f)

73-X. Instrumentation for Galvanizing Control. *Steel,* v. 140, June 17, 1957, p. 112-116.

Recording gas pressure controller and temperature recorders for controlling furnaces and zinc temperature in continuous galvanizing line for mild steel strip.
(X9s, L16, 1-2; *Zn,* CN)

74-X. Dial Indicators Lower Gaging Costs. Stanley DeGroff. *Steel,* v. 140, June 17, 1957, p. 126-131.

Factors in setting tolerance, gage selection and gage design for mechanical gaging of metal parts.
(X20b, 1-2)

75-X. Atmosphere Control. Pt. 1. Wayne L. Besselman. *Steel,* v. 140, May 20, 1957, p. 138-142.

Working principles of dew point, carbon potential and gas analyzers used for maintaining continuous control of heat treating furnace atmospheres. (X7f, X7g, 1-2, J2k)

76-X. Use of Zirconium Crucibles for Peroxide Fusions. H. E. Blake, Jr., and W. F. Holbrook. *Chemist-Analyst,* v. 46, June 1957, p. 42. (CMA)

Zirconium crucibles show only slight attack after 20 peroxide fusions. Life expectancy is greater than ten times that of iron, nickel or porcelain crucibles. The contamination problem would be less. Crucibles have been milled from zirconium bars or pressed from zirconium sheet. (X21g, 17-7; Zr)

77-X. New Instrument System Speeds Accurate Checks of Molten Metal Temperatures in Foundry Operations. *Industrial Heating,* v. 24, July 1957, p. 1330-1334.

Immersion platinum thermocouple, protected by a quartz sheath, is connected by extension wire to either a dial-faced indicator or strip chart recorder. (X9q, X9s; 14-10)

78-X. Study of the Utilization of a Solar Furnace for High-Temperature Research on Solids. T. E. Tietz and N. K. Hiester. Stanford Research Institute, (Air Force Office of Scientific Research). *U. S. Office of Technical Services,* PB 121930, Sept. 1956, 10 p. 50c.

Studies of theory, design and cost. (X24f, 16-13)

79-X. (French - German.) **Aluminum Foil in Thermal Insulation.** H. Bosshard. *Aluminium Suisse,* v. 7, May 1957, p. 106-108.

Manufactured under trade name of Alfol, applications include insallation of walls, roofs, reflective surfacing such as in radiant heating, in overs and ranges and in transport containers. (X24, 17-7; Al, 4-6)

80-X. (French-German.) **Aluminum Foil as a Stabilizing Element in Punched Cards.** O. Muller. *Aluminium Suisse,* v. 7, May 1957, p. 123.

Punched cards are subject to distortions caused by atmospheric humidity. To counter this tendency, found in the operation of the automatic Jacquard looms, cards are now made of aluminum foil backed on each side by paper. The three

layer cards are marketed under the trade name of Inexal and are unaffected by variations in atmospheric conditions. (X6, 17-7; Al, 4-6)

81-X. Evaluation of Approaches to the Study of the Physical Nature of Metallic Surfaces. M. K. Testerman. University of Arkansas. (Wright Air Development Center.) *U. S. Office of Technical Services,* PB 121971, Feb. 1957, 71 p. $2.

An instrument is proposed which makes use of the de Broglie matter waves. Fifty-KV helium ions bombard the specimen at a small angle. The reflected ions are magnified through an ion microscope which detects a signal proportional to the quantity of impinging ions. The surface of the metal is scanned and the detected signal, after being amplified, is recorded as a function of scanning. (X23, 1-2)

82-X. (French.) **Control and Regulation of Martin Furnace Operations—Importance and an Application.** P. Alleyrac and P. Rodicq. *Silicates Industriels,* Apr. 1957, p. 193-204.

IRSID (Insitut de Recherches de la Siderurgie), in cooperation with Ets. de Wendel, steel makers, Hayange, and MECI, Paris, instrument manufacturers, has undertaken a study to improve operating conditions of Martin furnaces by means of a control and regulation device. Instrument developed has made possible determination of best operating conditions for the experimental furnace, increase of approx. 10% in productivity, and improvement by 50% of the strength of the refractories. (X general, D3; ST)

83-X. Sodium Handling Equipment. J. F. Cage, Jr. Paper from "Symposium on Handling and Uses of the Alkali Metals". American Chemical Society, p. 60-66.

Equipment includes electromagnetic pumps, magnetic flowmeters, pressure transmitters and equipment for determining and controlling the oxide content of sodium systems characterized by being completely leakless and having no moving parts. 3 ref.
(X13, X12, 1-2; Na, 14-10)

84-X. Infrared Analyzers Monitoi Furnace Atmospheres. J. L. Garrison. *Iron and Steel Engineer,* v. 34, July 1957, p. 145-146.

Note on use of infrared analyzers for following the carbon monoxide, carbon dioxide or methane level in heat treating furnace atmospheres. Principle of infrared analyzer. (X7; J2k, 1-2)

85-X. Solar Furnace for Research in Nonferrous Metallurgy. W. M. Tuddenham. *Journal of Solar Energy Science and Engineering,* v. 1, Apr-July 1957, p. 48-51.

The installation and its characteristics as well as some of its projected uses. 5 ref. (X24f, 1-3, 16-13)

86-X. Seeing That One Micro-Inch Surface Finish. T. E. W. Preston. *Metalworking Production,* v. 101, July 19, 1957, p. 1237-1241.

Special surface finish microscope designed for examining metal surface irregularity. (X23q, 1-2)

87-X. Modern Metallographic Equipment. J. C. Wright. *Metal Treatment and Drop Forging,* v. 24, July 1957, p. 282-284.

Note on lenses, filters and photographic materials including characteristics of some black and white and color films for metallographic work. 4 ref. (X3c, X5s)

88-X. Modern Metallographic Equipment. Pt. 2. J. C. Wright. *Metal Treatment and Drop Forging,* v. 24, June 1957, p. 249-253.

Camera attachments and metallographic microscope for study of metal structures. (To be continued.) (X4a, 1-3)

89-X. (English.) **Symposium on New Metals for the Chemical Industry. Pt. 4. The Use of Tantalum and Titanium for the Construction of Apparatus.** A. A. F. Lagerwey and C. G. Van De Wateren. *Ingenieur,* v. 69, Aug. 2, 1957, p. 113-122.

Tantalum and titanium are expensive metals, and they require special techniques for metalworking. Therefore, these metals are only used where no other metals or alloys are economic in practice. Corrosion resisting properties of the two metals. Preliminary figures for cost of application. (X21, 17-7; Ta, Ti)

90-X. (French.) **Simultaneous Analysis by Impedance Readings and Dilatometry of Changes in Metals and Alloys.** Hervé Guyot. *Recherche Aeronautique,* Mar-Apr. 1957, no. 57-58, p. p. 51-57.

Impedance analysis makes it possible to measure with a good degree of precision resistivity of nonferromagnetic metals, initial permeability and various losses of ferromagnetic metals. Metallurgical interpretation

of these properties discussed; examples of application of method to the study of a nonmagnetic refractory alloy, and of allotropic transformation of electrolytic cobalt. Combination device described. 7 ref. (X25, X26, M23b, 1-3)

91-X. (German.) **Use of Thin Metal Foil as Image Amplifier in X-Ray Technique.** Fritz Günther and Bruno Beyer. *Archiv für das Eisenhüttenwesen,* v. 28, Apr. 1957, p. 207-212.

Investigation into image amplification effect of lead, tin, zinc and copper foil in the wave length applicable to visual inspection. 10 ref. (X5, 17-7; Pb, Sn, Zn, Cu, 4-6)

92-X. (French.) **Determination of Charge Level of Automatically Charged Cupolas.** *Journal d'Informations Techniques des Industries de la Fonderie,* no. 88, July 1957, p. 9-10.

Description of mirror, manometer and electrical reading devices. (X13, W18d, 1-2)

93-X. (French.) **Vacuum Ovens for Metallurgical Research.** M. T. Destribats. *Vide,* v. 12, Mar-Apr. 1957, p. 184-187.

Construction of vacuum ovens for lab work from ordinary commercial elements; operation. Ovens were used for heat treatment, solid state diffusion; could also be used as soaking pits. (X24f, 1-23)

94-X. (German.) **Determination of Hysteresis Losses of Silicon Sheets with a Device Measuring Complete Sheets.** Gerhard Wollweber. *Archiv für das Eisenhuttenwesen,* v. 28, July 1957, p. 397-399.

A new measuring device for hysteresis losses of complete sheets permits repeated indication of flux density with ± 5% and of hysteresis losses with ±1%. These values differ from those obtained in the Epstein-Rahmen from 3% to 5%. Thus the new device is suitable for sorting of sheets to close limits of hysteresis losses. (X26, 1-2; Fe, *Si,* SGA-n)

95-X. (Russian.) **Dependence Temperature on Specific Heat in the Aluminothermic Welding Process.** V. A. Bogolubov. *Stal',* v. 17, June 1957, p. 531-535.

Theoretical considerations, description of a calorimetric testing apparatus using tungsten-molybdenum thermocouple to corroborate the theoretical results. A practical application is the speeding up of the calculation of temperature in the aluminothermic process. Schematic and sectional drawings of the calorimeter. 6 ref. (X24e, 1-3, P12r, K1)

96-X. Apparatus for Determining the Hardness of Metals at Temperatures up to 3000° F. Elevated Temperature Hardness of Iron, Molybdenum, Tungsten and S-816. M. Semchyshen and C. S. Torgerson. *American Society for Metals, Transactions,* v. 50, Preprint no. 12, 1957, 9 p.

The principles of the pyramid penetration method of hardness testing have been embodied in the apparatus by the use of synthetic sapphire for the penetrator. The hardness determinations are carried out in a purified argon atmosphere which protects the test specimen and heating element from oxidation. (Q29p, 1-3, 1-4; Fe-a, Mo, W, SS)

97-X. A New Static Control System. Frank C. Fennell. *Iron and Steel Engineer,* v. 34, Aug. 1957, p. 125-132.

Magnetic amplifier acting as static-type switching system finds application in blast furnace charging equipment control, ore sintering plant feed control and reversing mill operations. (X13, D1, B16a, F23, 1-2; ST)

98-X. Apparatus for Determination of Hydrogen in Steel. L. Bjerkerud. *Jernkontorets Annaler,* v. 141, no. 2, 1957, p. 90-94. (*Henry Brutcher Translation* no. 4027.)

Previously abstracted from original. See item 49-X, 1957. (X21, 12, S11; ST, H)

99-X. Furnace Atmosphere Analyzers. Wayne L. Besselman. *Steel Processing and Conversion,* v. 43, Sept. 1957, p. 517-523, 525.

Discussion of dew point, infrared, hot wire and combustible analyzers, also analyzers for oxygen and specific gravity of gas. (X7j, 1-2, T2k)

100-X. Infrared Analyzers Monitor Furnace Atmospheres for Improved Heat Treating of Steel Products. J. L. Garrison. *Industrial Heating,* v. 24, Oct. 1957, p. 2011-2016.

Operating economy, simplified machining, and an increase in usable product are among the benefits achieved by automatic atmosphere monitoring with infrared analyzers. (X7, J2k; ST)

101-X. Saturable Reactor Control of Electric Furnaces. Pt. 1. R. M. Sills. *Industrial Heating,* v. 24, Oct. 1957, p. 2028-2036.

Where precise control of temperatures is needed, saturable reactors are applicable. Basic principles, construction and operation. (To be continued.) (X9s, W27j, 1-2)

102-X. (German.) **Modern Measuring and Regulator Equipments for Melting and Heat Treatment Furnaces.** A. Hohmann. *Giesserei-Praxis,* v. 75, Aug. 25, 1957, p. 354-355.

Equipment, operation; temperature regulation diagrams for gas and electric furnaces. (X9s, W18, W27, 1-2)

103-X. (Russian.) **Measurement of Temperature in Upper Part of Gas Checkers of Openhearth Regenerators in Kuznetsk Metallurgical Combine.** M. M. Epshtein. *Stal',* v. 17, No. 7, July 1957, p. 600-601.

Method eliminating contamination of thermocouple. Detailed diagram of the device. (X9, W18r, 1-2)

104-X. (German.) **Apparatus for Study of Gas-Metal Systems and Results of Measurements on the Tantalum-Oxygen System.** Erich Gebhardt and Hans-Dieter Seghezzi. *Zeitschrift für Metallkunde,* v. 48, Aug. 1957, p. 430-435.

Apparatus that permits direct and indirect heating of metal wire or band to its melting point. Results on damping and electrical resistance behavior during degassing of tantalum. Electrical resistance of tantalum increases linearly with concentration of oxygen dissolved in lattice. (X24f, P15g, 1-3; Ta)

105-X. Quartz Vacuum Furnace With Molybdenum and Tungsten Elements for Temperatures up to 3000° K. E. I. Smagina. *Henry Brutcher Translation* No. 3914, 2 p. (From *Zavodskaya Laboratoriya,* v. 22, no. 10, 1956, p. 1249-50.) Henry Brutcher, Altadena, Calif.

Special furnace without graphite or carbon heating elements, intended for vacuum synthesis, equilibrium studies at very high temperatures, studies of refractory metals; consists of a quartz tube fitting into a socket in a brass electrode; a heating element of sheet molybdenum for temperatures up to 2000° K. or with a tungsten spiral heating element for temperatures up to 2600° K. and higher. (X24f, 1-3, 1-23)

106-X. (German.) **Home-Made Heater for High-Temperature Metallography Temperature and Its Phenomena.** Irmtraud Pfeiffer. *Zeitschrift für Metallkunde,* v. 48, Apr. 1957, p. 171-175.

Vacuum heater for investigations up to 1100° C. Thermal etching is used to reveal structural details. Examples are: grain boundary movements, transformations and the dissolution of impurities. 7 ref. (X4, 1-2, 2-12, M20q)

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A

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Academy of Sciences of the USSR, Division of Chemical Sciences, Bulletin, c/o Consultants Bureau, 152 W. 42nd. St., New York 18, N. Y.

Acciaio Inossidabile, Edizioni Tecniche Siai Lerici, Milan, via Lancetti, 36, Italy.

Acier-Stahl-Steel, Centre Belgo-Luxembourgeois d'Information de l'Acier, 47, rue Montoyer, Brussels, Belgium.

Aciers Fins & Spéciaux Francais, La Chambre Syndicale des Producteurs d'Aciers Fins et Spéciaux, 12, rue de Madrid, Paris (8e), France.

Acoustical Society of America, Journal, American Institute of Physics, 57 E. 55th St., New York 22, N. Y.

Acta Chemica Scandinavica, Einar Munksgaard, Nörregade 6, Copenhagen, Denmark.

Acta Crystallographica, Einar Munksgaard, Nörregade 6, Copenhagen, Denmark.

Acta Metallurgica, Pergamon Press, Inc., 122 E. 55th St., New York 22, N. Y.

Acta Technica, Budapest, 62, Postafiók 440, Hungary.

Acustica, International Journal for Acoustics, S. Hirzel, Stauffacherquai 40, Zurich 4, Switzerland.

Adhaesion, Hadert-Lexikon-Verlag, Berlin, W. 30, Martin Luther Str. 88, Germany.

Advancement of Science, British Association for the Advancement of Science, Burlington House, London, W. 1, England.

Advances in Physics, Taylor and Francis Ltd., Red Lion Court, Fleet St., London, E. C. 4, England.

AEG Progress, c/o H. B. Pierce, Room 2204, 570 Lexington Ave., New York 22, N. Y.

Aeronautical Engineering Review, Institute of Aeronautical Sciences, Inc., 2 E. 64th St., New York 21, N. Y.

Aeronautical Quarterly, Royal Aeronautical Society, 4 Hamilton Place, London, W. 1, England.

Air Conditioning and Refrigeration News, Business News Publishing Co., 450 W. Fort St., Detroit 26, Mich.

Air Pollution Control Association, Journal, Box 93, Wilmerding, Pa.

Aircraft Production, Iliffe & Sons Ltd., Dorset House, Stamford St., London, S. E. 1, England.

Alloy Digest, Engineering Digest, Inc., P. O. Box 156, Upper Montclair, N. J.

Alloy Metals Review, High Speed Steel Alloys Ltd., Widnes, Lancashire, England.

Alluminio, Rivista dei Metalli Leggeri, Milan, via della Posta 8/10, Italy.

Aluminium, Aluminium-Verlag GmbH, Düsseldorf, Jagerhofstr. 26/29, Germany.

Aluminium Development Association, Information Bulletin, 33 Grosvenor St., London, W. 1, England.

Aluminium Laboratories Ltd., Abstract Bulletin, Kingston, Ont., Canada.

Aluminium Suisse, A. G. Fachschriften-Verlag & Buchdruckerei, Stauffacherquai 40, Zurich 4, Switzerland.

American Academy of Arts and Sciences, Proceedings, 77 Massachusetts Ave., Cambridge 39, Mass.

American Brewer, American Brewer Publishing Corp., 202 E. 44th St., New York 17, N. Y.

American Ceramic Society, Bulletin, 4055 N. High St., Columbus 14, Ohio.

American Ceramic Society, Journal, 4055 N. High St., Columbus 14, Ohio.

American Chemical Society, Journal, 1155 Sixteenth St., N. W., Washington 6, D. C.

American Electroplaters' Society, Proceedings, 445 Broad St., Newark 2, N. J.

American Foundrymen (See Modern Castings)
American Foundrymen's Society, Golf & Wolf Rds., Des Plains, Ill.
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Analyst, W. Heffer & Sons, Ltd., Cambridge, England.
Analytica Chimica Acta, Elsevier Press, Inc., 402 Lovett Blvd., Houston, Tex.
Analytical Chemistry, American Chemical Society, 1155 Sixteenth St., N. W., Washington 6, D. C.
Annales de chimie, Masson et Cie, Éditeurs, Librairie de l'Académie de Médecine, 120 blvd. St. Germain, Paris (6e), France.
Annales des Mines, Bureau de Documentation Miniere, 40 rue de Colisée, Paris (8e), France.
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Archiwum Hutnictwa, Zaktad Metali, ul. Mickiewicza 30, Kraków 2, Poland.
Arkiv für Fysik, Almqvist & Wiksells Boktryckeri AB, Stockholm, Sweden.
ASTM Bulletin, American Society for Testing Materials, 1916 Race St., Philadelphia 3, Pa.
Atom Praxis, G. Braun, Karlsrube, Karl-Friedrich Str. 14, Germany.
Atomes, 4, Placé de l'Odeon, 8, rue Crébillon, Paris (6e), France.
Atomic Energy Research Establishment, Great Britain, Her Majesty's Stationery Office, P. O. Box 569, London, S. E. 1, England.
Atomics and Nuclear Energy, Stratford House, 9 Eden St., London, N. W. 1, England.
Atomkern Energie, Academy of Sciences of the USSR, Moscow, USSR.
Atomnaya Energiya, Gosudarstvennoe Isdatel'stvo, Tekhniko-Teoreticheskoi Literatury, Moscow, USSR.
Australasian Engineer, Mechanical Engineer's Association, Inc., 20 Loftus St., Sydney, Australia.
Australasian Manufacturer, Manufacturer Publishing Co., Pty. Ltd., 16 Bond St., Sydney, Australia.
Australian Aeronautical Research Laboratories, Dept. of Supply, Research and Development Branch, Commonwealth of Australia, Melbourne, Australia.
Australian Institute of Metals, Journal, 18 Queen St., Melbourne, C. 1, Australia.
Automatic Machining, 65 Broad St., Rochester 14, N. Y.
Automation, Penton Publishing Co., Penton Bldg., Cleveland 13, Ohio.
Automobile Engineer, Iliffe & Sons, Ltd., Stamford St., London, S. E. 1, England.
Automotive Industries, Chilton Co., Chestnut & 56th Sts., Philadelphia 39, Pa.
Aviation Age, Conover-Mast Publications, 205 E. 42nd St., New York 27, N. Y.
Aviation Week, 330 W. 42nd St., New York 36, N. Y.
Avtomaticheskaya Svarka, Izdatel'stvo, Akademii Nauk, Ukrainskoi SSR, Kiev, USSR.

B

Battelle Technical Review, 505 King Ave., Columbus 1, Ohio.
Bell Laboratories Record, Bell Telephone Laboratories, Inc., 463 West St., New York 14, N. Y.
Birmingham Metallurgical Society, Journal, 253 Longbridge Lane, Northfield, Birmingham 31, England.
Blast Furnace and Steel Plant, Steel Publications, Inc., 330 Grant St., Pittsburgh 30, Pa.
British Cast Iron Research Association, Journal of Research and Development, Alvechurch, Birmingham, England.
British Foundryman, Institute of British Foundrymen, St. John St. Chambers, Deansgate, Manchester 3, England.
British Institution of Radio Engineers, Journal, 9 Bedford Sq., London, W. C. 1, England.

British Journal of Applied Physics, Institute of Physics, 47 Belgrave Sq., London, S. W. 1, England.
British Petroleum Equipment News, Council of British Manufacturers of Petroleum Equipment, 2 Princes Row, Buckingham Palace Rd., London, S. W. 1, England.
British Steelmaker, 7 Chesterfield Gardens, Mayfair, London, W. 1, England.
British Welding Journal, Institute of Welding, 54 Princes Gate, London, S. W. 7, England.
British Welding Research Association, 29 Park Crescent, London, W. 1, England.
Brown Boveri Review, Brown, Boveri and Co., Ltd., Baden, Switzerland.
Brutcher, Henry, Translations, P. O. Box 157, Altadena, Calif.
Bulletin de Microscopie Appliquée, Société revue d'optique, 3 blvd. Pasteur, Paris (15e), France.
Bureau of Ships Journal, Superintendent of Documents, U. S. Government Printing Office, Washington 25, D. C.

C

Colore, Istituto Propaganda Internazionale, Milan, via Tadino 62, Italy.
Canada Dept. of Mines and Technical Surveys, Mines Branch Research Report, Division of Administration, National Research Council, Ottawa 2, Ont., Canada.
Canadian Journal of Chemical Engineering, Chemical Institute of Canada, Ottawa, Ont., Canada.
Canadian Journal of Chemistry, Division of Administration, National Research Council of Canada, Ottawa 2, Ont., Canada.
Canadian Journal of Physics, Div. of Administration, National Research Council, Ottawa 2, Ont., Canada.
Canadian Machinery, Maclean-Hunter Publishing Co. Ltd., 481 University Ave., Toronto 2, Ont., Canada.
Canadian Metals, Box 4000, Terminal A., Toronto 1, Ont., Canada.
Canadian Metalworking, 1450 Don Mills Rd., Don Mills, Ont., Canada.
Canadian Mining Journal, National Business Publications, Ltd., Gardenvale, Que., Canada.
Canadian Mining and Metallurgical Bulletin, Canadian Institute of Mining and Metallurgy, 911 Drummond Bldg., Montreal, Que., Canada.
Canadian Welder, Stovel Advocate Publications, 365 Bannatyne Ave., Winnipeg, Man., Canada.
Casting Institute of Japan, Journal, Nippon Imono Kyokai, Totsukamachi, Toyko, Japan.
Casting Research Laboratory, Waseda University, 500 Totsuka 1-chome, Tokyo, Japan.
Castings, F. W. Publications, Wingello House, Angel Place, Sydney, Australia.
Centre de Documentation Sidérurgique, Circulaire d'Informations Techniques, 6, rue de Lota, Paris (16e), France.
Centre National de Recherches Métallurgiques, A.S.B.L., Section de Liège, Abbaye du Val Benoit, Liège, Belgium.
Ceramic Association of Japan, Journal, Yogyo Kyakai, 7 Sakuragawa-cho, Shiba Nishikubo, Minato-ku, Tokyo, Japan.
Ceramic Industry, Industrial Publications Inc., 5 S. Wabash Ave., Chicago 3, Ill.
Ceramica, l'Industria della Ceramica e Silicati, Milan, via F. Corridoni 3, Italy.
Chartered Mechanical Engineer, 1 Birdcage Walk, Westminster, London, S. W. 1, England.
Chemical Age (London), 154 Fleet St., London, E. C. 4, England.
Chemical Engineering, McGraw-Hill Publishing Co., 330 W. 42nd St., New York 36, N. Y.
Chemical and Engineering News, 1155 Sixteenth St., N. W., Washington 6, D. C.
Chemical Engineering and Mining Review, Tait Publishing Co., 349 Collins St., Melbourne, C. 1, Australia.
Chemical Engineering Progress, American Institute of Chemical Engineers, 25 W. 34th St., New York 36, N. Y.
Chemical & Process Engineering, Leonard Hill Ltd., Stratford House, 9 Eden St., London, N. W. 1, England.
Chemical Processing, Putnam Publishing Co., 111 E. Delaware Place, Chicago 11, Ill.
Chemical Society of Japan, Bulletin, 1-chomo, Surugadai-Kanda, Chiyoda-ku, Tokyo, Japan.
Chemical Week, McGraw-Hill Publishing Co., Inc., 330 W. 42nd St., New York 36, N. Y.
Chemie-Ingenieur Technik, Verlag Chemie GmbH, Frankfurt am Main, Weinheim/Bergstr. 17a, Germany.

Chemiker Zeitung, Alfred Hüthig Verlag, Heidelberg, Wilckenstr. 3, Germany.

Chemische Rundschau, Buchdruckerei Vogt-Schild AG, Solothurn, Switzerland.

Chemische Technik, Verlag Technik GmbH, Berlin, N. W. 7, Unter den Linden 12, Germany.

Chemistry and Industry, Society of Chemical Industry, 14-16 Belgrave Sq., London, S. W. 1, England.

Chimie et Industrie, Presses Documentaires, 28 rue St.-Dominique, Paris (7e), France.

Ciencia y Técnica de la Soldadura, Instituto de la Soldadura, Goya, 58, Madrid, Spain.

Civil Engineering, American Society of Civil Engineers, 20th & Northampton Sts., Easton, Pa.

Cleaning and Maintenance, Wheatland Journals, Ltd., 1 Stamford St., London, S. E. 1, England.

Coal Utilization, Mechanization Inc., Munsey Bldg., Washington 4, D. C.

Columbia Engineering Quarterly, School of Engineering, Columbia University, New York 27, N. Y.

Columbia Southern Chemicals, 632 Ft. Duquesne Blvd., Pittsburgh 22, Pa.

Combustion, Combustion Publishing Co., Inc., 200 Madison Ave., New York 16, N. Y.

Commonwealth Engineer, Tait Publishing Co. Pty. Ltd., 349 Collins St., Melbourne, C. 1, Australia.

Compressed Air Magazine, 942 Memorial Pkwy., Phillipsburg, N. J.

Comptes Rendus, Academie des Sciences, Gauthier-Villars, 55 quai des Grands-Augustins, Paris (6e), France

Congresso Internazionale des Vetro, Assoiazione Nazionale Degli Industriali del Vetro, Rome, Italy.

Construction Review, U. S. Bureau of Labor, Statistics Regional Offices, 341 Ninth Ave., New York 1, N. Y.

Consultants Bureau, Inc., 227 W. 17th St., New York 11, N. Y.

Corrosion, National Association of Corrosion Engineers, 1061 M & M Bldg., 1 Main St., Houston 2, Tex.

Corrosion et Anticorrosion, 28, rue St.-Dominique, Paris (7e), France.

Corrosion Prevention and Control, Holland House, 140 Cromwell Rd., London, S. W. 7, England.

Corrosion Technology, Leonard Hill House, 9 Eden St., London, N. W. 1, England.

Courrier de la Normalisation, Association Francaise de Normalisation, 23, rue Notre Dames des Victoires, Paris (2), France.

Cuivre Laitons Alliages, 45, ave. du Roule, Neuilly (Seine), France.

Czechoslovakia Heavy Industry, Chamber of Commerce, Praha 1, ul. 28, října 13, Prague, Czechoslovakia.

D

Design Engineering, Maclean-Hunter Publishing Co. Ltd., P. O. Box 100, Toronto, Ont., Canada.

Design News, Rogers Publishing Co., 1220 S. Woodward Ave., Royal Oak, Mich.

Discovery, Jerrold and Sons Ltd., Norwich, England.

Documentation Metallurgique, Société de l'industrie Minérale, 19, rue du Grand-Moulin, St.-Etienne (Loire), France.

Doklady Akademii Nauk SSSR, Akademii Nauk SSSR, Moskva, Shubinskii per., 10 (Moscow, USSR).

Draht, Prost & Meiner-Verlag, (13a), Coburg/Oft., Germany.

Draht (English Edition), Fachzeitschrift Draht, Coburg/Ofr., Postfach 691, Germany.

E

Economic Geology, Economic Geology Publishing Co., Urbana, Ill.

Edgar Allen News, Edgar Allen and Co., Ltd., 3 St. James Sq., London, S. W. 1, England.

Edison Electric Institute, Bulletin, 420 Lexington Ave., New York 17, N. Y.

Electrical Energy, Morgan Brothers Ltd., 28 Essex St., Strand, London, W. C. 2, England.

Electrical Journal, Benn Brothers Ltd., 154 Fleet St., London, E. C. 4, England.

Electrical Manufacturing, Gage Publishing Co., 1250 Sixth Ave., New York 36, N. Y.

Electrical Review, English Electric Co., Queens House, Kingsway, London, W. C. 2, England.

Electrical Times, Electrical Times Ltd., Sardinia St., London, W. C. 2, England.

Electrical World, McGraw-Hill Publishing Co., Inc., 330 W. 42nd St., New York 36, N. Y.

Electrochemical Society, Journal, 1860 Broadway, New York 23, N. Y.

Electrochemical Society of Japan, Journal (Denki Kagaku), 3, 1-chome, Yurakucho, Chiyodaku, Tokyo, Japan.
Electronics, McGraw-Hill Publishing Co., 330 W. 42nd St., New York 36, N. Y.
Electroplating and Metal Finishing, 85 Udney Park Rd., Teddington, Middlesex, England.
Endeavour, Imperial Industries Ltd., North Block, Thames House, Millbank, London, S. W. 1, England.
Energia Nucleare, Milan, via Serbelloni, 7, Italy.
Engenharia, Mineracão e Metalurgia, rua 7 of Setembro, 135-2°, Rio de Janeiro, Brasil.
Engineer, Morgan Brothers Ltd., 28 Essex St., Strand, London, W. C. 2, England.
Engineer and Foundryman, 206-8 Jubilee House, 15 Simmonds St., Johannesburg, Union of South Africa.
Engineering, 330 W. 42nd St., New York 36, N. Y.
Engineering (British), 35 Bedroad St., Strand, London, W. C. 2, England.
Engineering and Mining Journal, McGraw-Hill Publishing Co., Inc., 330 W. 42nd St., New York 36, N. Y.
Engineers' Digest, 120 Wigmore St., London, W. 1, England, (Or 366 Madison Ave., New York 17, N. Y.)

F

Farady Society, Transactions, 6 Upper Kirkgate, Aberdeen, England.
Feingerate Technik, VEB Verlag Technik, Berlin, N. W. 7, Unter den Linden 12, Germany.
Fertigungstechnik, VEB Verlag Technik, Berlin, C. 2, Oranienburger Str., 13/14, Germany.
Fiat, Stabilimento Grandi Motori, Technical Bulletin, Torino, via Cuneo, 20, Italy.
Finish, (Formerly Metal Products Manufacturing), Dana Chase Publications, York St., at Park Ave., Elmhurst, Ill.
Finland Geologinen Tutkimuslaitos, Geologinen Tutkimuslaitos, Helsinki, Finland.
Fire Engineering, 305 E. 45th St., New York 17, N. Y.
Fizika metallov i metallovedenie, "Akademkniga," Moskva, Pushkinskaia, ul. 23 (Moscow, USSR).
Fonderia, Milan, via Mameli, 19, Italy.
Fonderia Italiana, Milan, via Moscova, 16, Italy.
Fonderie, Editions Techniques des Industries de la Fonderie, 12, ave. Raphael, Paris (16^{e}), France.
Fonderie Belge, Association Technique de Fonderie de Lulgique, 21, rue des Drapiers, Brussels, Belgium.
Food Engineering, McGraw-Hill Publishing Co., Inc., 330 W. 42nd St., New York 36, N. Y.
Foundry, Penton Publishing Co., Penton Bldg., Cleveland 13, Ohio.
Foundry Trade Journal, Industrial Newspapers Ltd., John Adam House, 17-19 John Adam St., London, W. C. 2, England.
Franklin Institute, Journal, Franklin Institute of the State of Pennsylvania, Philadelphia 3, Pa.
Fusion de Metales, Apartado 667, Monterrey, N. L., Mexico.

G

Galvano, 79 ave. des Champs-Elysées, Paris (8^{e}), France.
Gas, Jenkins Publications, Inc., 198 S. Alvarado St., Los Angeles 4, Calif.
Gas Age, 48 W. 38th St., New York 18, N. Y.
Gas and Oil Power, 9 Catherine Place, London, S. W. 1, England.
Gas Journal, Walter King, Ltd., 11 Bolt Ct., Fleet St., London, E. C. 4, England.
General Electric Review, General Electric Co., Schenectady 5, N. Y.
General Motors Engineering Journal, Educational Relations Section, Dept. of Public Relations, GM Technical Center, P. O. Box 177, North End Station, Detroit 2, Mich.
Genie Civil, 5 rue Jules-Lefebvre, Paris (9^{e}), France.
Geochimica et Cosmochimica Acta, Pergamon Press Ltd., 4 & 5 Fitzroy Sq., London, W. 1, England. (Or Pergamon Press Inc., 122 E. 55th St., New York 22, N. Y.)
Giesserei, Giesserei-Verlag, GmbH, Dusseldorf, Breite Str., 27, Germany.
Giesserei-Praxis, Fachverlag Schiele und Schon, GmbH, Berlin, S. W. 61, Boppstr. 10, Germany.
Giessereitechnik, VEB Verlag Technik, Berlin, N. W. 8, Unter den Linden, 12, Germany.
Gjuteriet, Karlävagen 43, 2 tr., Stockholm, O, Sweden.

Government Mechanical Laboratory, Sumiyoshi-cho Suginami-ku, Tokyo, Japan.
Grinding and Finishing, Hitchcock Publishing Co., 222 E. Willow Ave., Wheaton, Ill.

H

Haerterei-Technische Mitteilungen, Deutscher Fachbuch Verlag, Deutsche Verlags Anstatt, Stuttgart, Germany.
H. M. Stationery Office, Box 569, London, S. E. 1, England.
Hutnické Listy, Praha II, Spalena 51, Prague 11, Czechoslovakia.
Hutnik, Central Kolportazu Prasy i Wydawictw "Ruch," ul. Srebrna 12, Warsaw, Poland.

I

IBM Journal of Research and Development, 590 Madison Ave., New York 22, N. Y.
INCO, International Nickel Co. Inc., 67 Wall St., New York 5, N. Y.
Indian Academy of Sciences, Proceedings, Bangalore, India.
Indian and Eastern Engineer, 235 Dr. D. Naoroji Rd., Bombay 1, India.
Indian Institute of Metals, Transactions, 31, Chowringhee Rd., Calcutta-16, India.
Indian Institute of Science, Journal, Bangalore 3, India.
Indian Textile Journal, Surya Mahal, Military Sq., Fort, Bombay, India.
Industrial and Engineering Chemistry, American Chemical Society, 1155 Sixteenth St., N. W., Washington 6, D. C.
Industrial and Mining Standard, 393 Flinders Lane, Melbourne, Australia.
Industrial Chemistry, 33 Tothill St., Westminster, London, S. W. 1, England.
Industrial Diamond Review, N.A.G. Press Ltd., 226 Latymer Court, Hammersmith, London, W. 6, England.
Industrial Finishing, 1142 N. Meridian St., Indianapolis 4, Ind.
Industrial Finishing (London), Arrow Press Ltd., 1 Stamford St., London, S. E. 1, England.
Industrial Gas, Moore Publishing Co., Inc., Emmett St., Bristol, Conn.
Industrial Gas (London), Arrow Press Ltd., 1 Stamford St., London, S. E. 1, England.
Industrial Heating, National Industrial Publishing Co., Union Trust Bldg., Pittsburgh 19, Pa.
Industrial Improvement, Industrial Improvement Association, 630 Dundee Rd., Northbrook, Ill.
Industrial Laboratories, Industrial Laboratories Publishing Co., 201 N. Wells St., Chicago 6, Ill.
Industrie-Anzeiger, Verlag W. Girardet, Essen, Germany.
Industrie Chimique Belge, 32 rue Joseph II, Brussels, Belgium.
Industry and Welding, Industrial Publishing Corp., 812 Huron Rd., Cleveland 15, Ohio.
Ingenierie e Industria, ave. de Mayo 963, Buenos Aires, Brasil.
Ingegneria Meccanica, Milan, via Fontoni 47, Italy.
Ingegneria Sanitaria, Istituto Propaganda Internazionale, Milan, via Tadino 62, Italy.
Ingenieur, N. V. Oosthoek's Uitgevers Maatschappij, Domstr. 1-3, Utrecht, Netherlands.
Ingenioren, Vester Farimagsgade 31, Copenhagen 5, Denmark.
Inspection Engineer, Thomas Mercer, Ltd., St. Albans, England.
Institut de Recherches de la Siderurgie (IRSID), Publications, 185, rue President-Roosevelt, St.-Germaine-en-Laye, France.
Institut International du Froid, Bulletin, 177 blvd. Malesherbes, Paris (17^{e}), France.
Institute of Fuel, 18 Devonshire St., Portland Place, London, W. 1, England.
Institute of Metal Finishing, Bulletin, 32 Great Ormond St., London, W. C. 1, England.
Institute of Metals, Journal, 17 Belgrave Sq., London, S. W. 1, England.
Institute of Radio Engineers, Proceedings, Transactions on Electron Devices, 1 E. 79th St., New York 21, N. Y.
Institution of Electrical Engineers, Proceedings, Radio and Electronic Engineering, Savoy Place, London, W. E. 2, England.
Institution of Heating and Ventilating Engineers, Journal, 49 Cadlogan Sq., London, S. W. 1, England.
Institution of Mining and Metallurgy, Bulletin, 44 Portland Place, London, W. 1, England.
Institution of Production Engineers, Journal, 10 Chesterfield St., London, W. 1, England.

Instituto del hierro y del acero, Artes Graficas, Langa y Compania, Madrid, Spain.

Instituto Sperimentale dei Metalli, Leggeri, Milan, via della Posta 8, Italy.

Instrument Engineer, George Kent Ltd., Luton, Bedfordshire, England.

Instruments and Laboratories, 92, rue Bonaparte, Paris (6e), France.

Instrumentation, Minneapolis-Honeywell Regulator Co., Wayne and Windrim Aves., Philadelphia 44, Pa.

International Association for Bridge and Structural Engineers, Publications, School of Civil Engineering, 33 Leonardstr., Zurich, Switzerland.

International Journal of Applied Radiation and Isotopes, Pergamon Press, 4 & 5 Fitzroy Sq., London, W. 1, England.

IRE Proceedings, Institute of Radio Engineers, Inc., 1 E. 79th St., New York 21, N. Y.

Iron Age, Chilton Co., Chestnut & 56th St., Philadelphia 39, Pa.

Iron and Coal Trades Review, Industrial Newspapers Ltd., 17 John Adam St., Adelphi, London, W. C. 2, England.

Iron and Steel, Iliffe & Sons Ltd., Dorset House, Stamford St., London, S. E. 1, England.

Iron and Steel Engineer, Association of Iron and Steel Engineers, 1010 Empire Bldg., Pittsburgh 22, Pa.

Iron and Steel Institute, Journal, 4 Grosvenor Gardens, London, S. W. 1, England.

Iron and Steel Institute of Japan, Journal, Naka 14-Gokan, 16, 2-chome, Chiyoda-ku, Tokyo, Japan.

Izvestiia Akademii Nauk SSSR, Otleleni Khimicheskikh Nauk, Izdatel'stvo Akademii Nauk SSSR (Moscow, USSR).

J

Japan Analyst, Analytical Chemical Society of Japan, Faculty of Engineering, Tokyo University, Tokyo, Japan.

Japan Institute of Metals, Journal, Japan Institute of Metals, Sendai, Japan.

Japan Iron and Steel Federation, No. 1, 1-chome, Marunouchi, Chiyoda-ku, Tokyo, Japan.

Japan Science Review, Mining and Metallurgy, Scientific Information Div., Ministry of Education, Tokyo, Japan.

Japan Society of Mechanical Engineers, Transactions, Tokyo, Japan.

Jernkontorets Annaler, Kungsträdgardsgatan 6, Stockholm C, Sweden.

Journal de chimie physique, École Nationale Supèrieure de Chemie, 11, rue Pierre-Curie, Paris (5e), France.

Journal du Four Electrique, 86, rue Cardinet, Paris (17e), France.

Journal of Applied Chemistry of the USSR, Consultants Bureau, 152 W. 42nd St., New York 18, N. Y.

Journal of Applied Mechanics, American Society of Mechanical Engineers, 29 W. 39th St., New York 18, N. Y.

Journal of Chemical Physics, American Institute of Physics, Prince & Lemon St., Lancaster, Pa.

Journal of Electronmicroscopy, Society of Electronmicroscopy, Institute of Industrial Science, Tokyo University, Yayoicho, Chiba City, Chiba Perfecture, Japan.

Journal d'Informations Techniques des Industries de la Fonderie, Éditions Techniques, 12, ave. Raphael, Paris (16e), France.

Journal of Inorganic and Nuclear Chemistry, Pergamon Press Ltd., 4 & 5 Fitzroy Sq., London, W. 1, England.

Journal of the Mechanical Laboratory of Japan, Government Mechanical Laboratory, Sumiyoshi-cho, Saginami-ku, Tokyo, Japan.

Journal of the Mechanics and Physics of Solids, Pergamon Press Ltd., 4 & 5 Fitzroy Sq., London, W. 1, England. (Or 122 E. 55th St., New York 22, N. Y.)

Journal of Metals, American Institute of Mining, Metallurgical and Petroleum Engineers, 29 W. 39th St., New York 18, N. Y.

Journal of Nuclear Energy, Pergamon Press Ltd., 4 & 5 Fitzroy Sq., London, W. 1, England. (Or 122 E. 55th St., New York 22, N. Y.)

Journal of Physical Chemistry, American Chemical Society, 1155 Sixteenth St., N. W., Washington 6, D. C.

Journal of Physics and Chemistry of Solids, Pergamon Press Ltd., 4 & 5 Fitzroy Sq., London, W. 1, England.

Journal of Research and Development, British Cast Iron Research Association, Alvechurch, Birmingham, England.

Journal of Research, National Bureau of Standards, U. S. Government Printing Office, Washington 25, D. C.

Journal of Scientific and Industrial Research, Old Mill Rd., New Delhi 2, India.

Journal of Scientific Instruments, Institute of Physics, 47 Belgrave Sq., London, S. W. 1, England.

K

Khoszati Lapok, Budapest, V, Vadasz-utca 16, Hungary.

Kongelige Norske Videnskabers Selskabs, 1 Kommisjon Hos F., Bruns Bokhandel, Trondhjem, Norway.

Korose a Ochrana Materialu, u Mistanskiho Pinovaru 4, Praha VII, Czechoslovakia.

Kraftfahrzeugtechnik, Vienna 6, Mariahilferstra 1/c, Austria.

Kyoto University, Faculty of Engineering, Memoirs, Kyoto University, Kyoto, Japan.

L

Lastechniek, Nederhandse Vereniging voor Lastechniek, Zeestra. 62, The Hague, Netherlands.

Light Metal Age, 549 W. Randolph St., Chicago 6, Ill.

Light Metals (Japan), Hibuija Asai Seinei Bldg., No. 2, 1, Yuraku-cho, Chi Yo Da-ku, Tokyo, Japan.

Light Metals Bulletin, British Aluminium Co. Ltd., Norfolk House, St. James Sq., London, S. W. 1, England.

Linde Tips, Linde Air Products, 30 E. 42nd St., New York, N. Y.

Liteinoe Proizvodstvo, Gosudarstvennoe Nauchno-Tekhnicheskoe Izdatel'stvo Mashino-stroitel'-noi Literatury, Moscow, USSR.

Lubrication, Texas Co., 135 E. 42nd St., New York 17, N. Y.

Lubrication Engineer, American Society of Lubrication Engineers, 84 E. Randolph St., Chicago 1, Ill.

M

Macchine, Milan, via Mameli 19, Italy.

Machine and Tool Blue Book, Hitchcock Publishing Co., 222 E. Willow Ave., Wheaton, Ill.

Machine Design, Penton Publishing Co., Penton Bldg., Cleveland 13, Ohio.

Machine Modern, 15 rue Bleue, Paris (9e), France.

Machinery (London), Clifton House, 83-117 Euston Rd., London, N. W. 1, England.

Machinery, Industrial Press, 93 Worth St., New York 13, N. Y.

Machinery Lloyd, Machinery Publishing Co., Ltd., National House, West St., Brighton, England.

Machinery Lloyd (Overseas Edition), Continental and Overseas Organization Ltd., 6 Cavendish Place, Regent St., London, W. 1, England.

Machinery Market, 146a Queen Victoria St., London, E. C. 4, England.

Magazine of Standards, American Standards Association, Inc., 70 E. 55th St., New York 17, N. Y.

Magnesium, Brooks & Perkins Inc., 1950 W. Fort St., Detroit 16, Mich.

Marine Engineer and Naval Architect, Whitehall Technical Press, Ltd., 9 Catherine Place, London, S. W. 1, England.

Mass Production, 4 Ludgate Circus, London, E. C. 4, England.

Materials in Design Engineering (formerly Materials and Methods), Reinhold Publishing Corp., 430 Park Ave., New York 22, N. Y.

Materie Plastiche, Milan, via Farneti 8, Italy.

Mechanical Engineering, American Society of Mechanical Engineers, 29 W. 39th St., New York 18, N. Y.

Mechanical World and Engineering Record, Emmott & Co., Ltd., 31 King St. W., Manchester 3, England.

Messe-Kurier, Verlag und Redaktion, Hannover 6, Postschliessfach 6147, Germany.

Metaalinstituut T.N.O., Drukkerij-Uitgeverii, "De Hofstad," Scheepmarkerstr.-1-3, 's-Gravenhage, Netherlands.

Metal Finishing, Finishing Publications, Inc., 381 Broadway, Westwood, N. J.

Metal Finishing Journal, Industrial Newspapers Ltd., John Adam House, 17-19 John Adam St., Adelphi, London, W. C. 2, England.

Metal Industry, Iliffe & Sons Ltd., Dorset House, Stamford St., London, S. E. 1, England.

Metal Powder Association, Proceedings, 130 W. 42nd St., New York 36, N. Y.

Metal Products Manufacturing (See Finish)

Metal Progress, American Society for Metals, 7301 Euclid Ave., Cleveland 3, Ohio.

Metal Testing, Metal Treating Institute, 271 North Ave., New Rochelle, N. Y.

Metal Treatment and Drop Forging, Industrial Newspapers Ltd., John Adam

House, 17-19 John Adam St., Adelphi, London, W. C. 2, England.

Metalen, "De Hofstad," Scheepmakersstra. -1-3, 's-Gravenhage, Netherlands.

Metall, Metall-Verlag GmbH, Berlin-Grunewald, Hubertusalle 18, Germany.

Metalloberfläche, Carl Hanser Zeitschriften Verlag GmbH, Munich 27, Leonhard-Eck-Str. 7, Germany

Metallovedenie i Obrabotka Metallov, Moskva, K12, ul. Kuibysheva 4 (Moscow, USSR).

Metallurgia, The Kennedy Press, Ltd., 31, King St., W., Manchester 3, England.

Metallurgia Italiana, Associazione Italiana di Metallurgia, Milan, via Moscova, 16, Italy.

Metallurgical Reviews, Institute of Metals, 17 Belgrave Sq., London, S. W. 1, England.

Métallurgie et la Construction Mechanique, 79, ave. des Champs-Elysees, Paris (8^e), France.

Metallurgie und Giessereitechnik, Berlin, W. 8, Unter den Linden 12, Germany.

Metallwaren-Industrie und Galvanotechnik, Eugen G. Leuze-Verlag, Wurttemberg, Sikhstra. 3, Soulgau 1, Germany.

Metals (Japanese), Agne Publishing Co., 10 Ichibancho, Chiyoda-ku, Tokyo, Japan.

Metalworking, Metalworking Publishing Co., Inc., Orange, Conn.

Metalworking Production, McGraw-Hill Publishing Co., Ltd., 95 Farrington St., London, E. C. 4, England.

Métaux, Corrosion-Industries, Éditions Métaux, 32, rue du Marechal-Joffre, St.-Germain-en-Laye (Seine et Oise), France.

Metropolitan-Vickers Gazette, Metropolitan Vickers Electrical Co., Ltd., Trafford Park, Manchester 17, England.

Microtecnic, Scriptar Ltd., 23 ave. de la Gare, Lousanne, Switzerland.

Mill and Factory, Conover-Mast Publications, Inc., 205 E. 42nd St., New York 17, N. Y.

Mine and Quarry Engineering, Tothill Press Ltd., 33 Tothill St., London, S. W. 1, England.

Mines Magazine, Colorado School of Mines Alumni Association, 734 Cooper Bldg., Denver 2, Colo.

Mining Congress Journal, American Mining Congress, Ring Bldg., Washington 6, D. C.

Mining Engineering, American Institute of Mining, Metallurgical and Petroleum Engineers, 29 W. 39th St., New York 18, N. Y.

Mining Journal, 15 Wilson St., Moorgate, London, E. C. 2, England.

Mining Magazine, Mining Publications Ltd., 482 Salisbury House, London Wall, London, E. C. 2, England.

Mining World, American Trade Journal, Inc., 121 Second St., San Francisco 5, Calif.

Ministere de l'Air, Publications Scientifiques et Techniques, Documentation et d'Information Technique, 2 ave. de la Porte-d'Issy, Paris, France.

Missiles and Rockets, American Aviation Publications, 1001 Vermont Ave., N. W., Washington 5, D. C.

Modern Castings, American Foundrymen's Society, Inc., Golf & Wolf Rds., Des Plains, Ill.

Modern Industrial Press, Watson Publishing Inc., 201 N. Wells St., Chicago 6, Ill.

Modern Machine Shop, Gardner Publications, Inc., 431 Main St., Cincinnati 2, Ohio.

Modern Metals, Modern Metals Publishing Co., 435 N. Michigan Ave., Chicago 11, Ill.

Modern Power and Engineering, Maclean-Hunter Publishing Co., Ltd., 491 University Ave., Toronto 2, Ont., Canada.

Monatshefte für Chemie, Springer-Verlag, Vienna I, Molkerbastei 5, Austria.

Murex Ltd. Review, Rainham, Essex, England.

N

Nafta, Wydownictwo Gorniczo Hutnicze, ul. Stawowa 19, Stalingrad, USSR.

National Bureau of Standards, Technical News Bulletin, Superintendent of Documents, U. S. Government Printing Office, Washington 25, D. C.

National Safety News, National Safety Council, Inc., 425 N. Michigan Ave., Chicago 11, Ill.

Nature, Macmillan and Co. Ltd., St. Martin's St., London, W. C. 2, England. (Or St. Martin's Press Inc., 103 Park Ave., New York 17, N. Y.

Nature, 92, rue Bonaparte, Paris (6), France.

Naturwissenschaften, Springer-Verlag, Berlin, W. 35, Reichpietschufer 20, Germany.

Navires, Ports et Chantiers, Societe du Journal de la Marine Marchande, 190 blvd. Haussmann, Paris, France.

Neue Hütte, VEB Verlag Technik, Berlin, W. 8, Unter den Linden 12, Germany.

New Mexico Institute of Mining and Technology, Bulletin, Campus Station, Socorro, N. Mex.

New Scientist, Cromwell House, Fulwood Place, High Holborn, London, W. C. 1, England.

New York Academy of Sciences, 2 E. 63rd St., New York 21, N. Y.

New York Industrial World, Plainfield, N. J.

New Zealand Engineering, Technical Publications Ltd., Dominion Bldg., C.P.O., Box 1001, Wellington, New Zealand.

Nickel, Centro d'Informazioni del Nickel, Milan, Corro Monforte, 48, Italy.

Nippon Kikai Gakaishi (See Society of Mechanical Engineers of Japan, Journal).

Nondestructive Testing, 1109 Hinman Ave., Evanston, Ill.

Norelco Reporter, North American Philips Co., Inc., 750 E. Fulton Ave., Mt. Vernon, N. Y.

Normandie Industrielle, 22, rue des Bons-Enfants, Rouen, France.

Northwestern Engineer, Student Publication of the Technological Institute, Northwestern University, Evanston, Ill.

Notas de Fisica, Centro Brasileiro de Pesquisas Fisicas, ave. Wenceslau Braz 71, Rio de Janeiro, Brasil.

Nuclear Power, Rowse Muir Publications Ltd., 2 Percy St., London, W. 1, England.

Nucleonics, McGraw-Hill Publishing Co., Inc., 330 W. 42nd St., New York 36, N. Y.

Nuovo Cimento, Bologna, via Irnerio 34, Italy.

O

Oerlikon Schweisomitteilungen, Bührle & Co., Zurich, Birchstr. 230, Switzerland.

Office of Technical Information, National Bureau of Standards, Washington 25, D. C.

Oil and Colour Chemists' Association, Journal, Memorial Hall, Farringdon St., London, E. C. 4, England.

Oil and Gas Journal, Petroleum Publishing Co., 211 S. Cheyenne Ave., Tulsa 1, Okla.

Ontario-Hydro Research News, Hydro-Electric Power Commission of Ontario, 620 University Ave., Toronto, Ont., Canada.

Optical Society of America, Journal, American Institute of Physics, 57 E. 55th St., New York 22, N. Y.

Ordnance, American Ordnance Association, 708 Mills Bldg., Washington 6, D. C.

Organic Finishing, Finishing Publications Inc., 381 Broadway, Westwood, N. J.

Osaka University, Technology Reports, Faculty of Engineering, Osaka University, Higashinada, Osaka, Japan.

P

Pacific Factory, 709 Mission St., San Francisco, Calif.

Packaging Review, Harlequin Press, Drury House, Russell St., London, England.

Paint, Oil and Colour Journal, Scott, Greenwood & Son, Ltd., 83 Farringdon St., London, E. C. 4, England.

Paint Technology, 58 College Rd., Harrow, Middlesex, England.

Paper Trade Journal, Lockwood Trade Journal Inc., 15 W. 47th St., New York 36, N. Y.

Peintures-Pigments-Vernis, 28, rue St.-Dominique, Paris (7e), France.

Pennsylvania State College, Circular, The Mineral Industries Experiments Station, College of Mineral Industries, The Pennsylvania State University, University Park, Pa.

Petroleum, Leonard Hill Ltd., 9 Eden St., London, N. W. 1, England.

Petroleum Engineer, Petroleum Engineer Publishing Co., 800 Davis Bldg., Dallas 2, Tex.

Petroleum Refiner, Gulf Publishing Co., Box 2608, Houston 1, Tex.

Philips Research Reports, N.V. Philips' Gloeilampenfabrieken, Eindhoven, Netherlands.

Philips Technical Review, N. V. Philips' Gloeilampenfabrieken, Eindhoven, Netherlands.

Philosophical Magazine, Taylor and Francis Ltd., Red Lion Court, Fleet St., London, E. C. 4, England.

Physica, Bylhouwerstr. 6, Utrecht, Netherlands.

Physical Review, American Institute of Physics, 57 E. 45th St., New York 22, N. Y.

Physical Society, Proceedings, 1 Lowther Gardens, Prince Consort Rd., London, S. W. 7, England.

Piping and Engineering, Tube Turns of Canada, Ltd., Ridgetown, Ont., Canada; also Tube Turns Research Staff, Louisville 1, Ky.

Planseeberichte für Pulvermetallurgie, Wagner'sche Univ.-Buchdruckerei GmbH, Innsbruck, Erlestr. 5-7, Austria.

Plant Administration, Maclean-Hunter Publishing Co., Ltd., 481 University Ave., Toronto, Ont., Canada.

Plant Engineering, Technical Publishing Co., 110 Dearborn St., Chicago 3, Ill.

Plastics, Temple Press Ltd., Bowling Green Lane, London, E. C. 1, England.

Platinum Metals Review, Johnson, Matthey & Co., Ltd., Hatton Garden, London, E. C. 1, England. (Or 508 Fifth Ave., New York, N. Y.

Plating, American Electroplaters' Society, Inc., 445 Broad St., Newark 2, N. J.

Power Apparatus and Systems, American Institute of Electrical Engineers, 33 W. 39th St., New York 18, N. Y.

Power Engineering, Technical Publishing Co., 110 S. Dearborn St., Chicago 3, Ill.

Powder Metallurgy Bulletin, American Electro Metal Corp., 320 Yonkers Ave., Yonkers 2, N. Y.

Prace Instytutow Ministerstwa Hutnictwa, Institut Metallurgii, Wydawnictwo Gorniczo-Hutnicze, Katowice, Poland.

Pratique des Industries Mecaniques, Dunod, 92, rue Bonaparte, Paris (6e), France.

Praxis der Physik/chemie Photographie, Aulis Verlag, Frankenberg/Eder, Germany.

Precision Metal Molding, Industrial Publishing Corp., 812 Huron Rd., Cleveland 15, Ohio.

Process, Art & Technics Ltd., 58 Frith St., London, W. 1, England.

Process Control and Automation, Colliery Guardien Co., Ltd., 30 Furnival St., London, E. C. 4, England.

Product Engineering, McGraw-Hill Publishing Co., Inc., 330 W. 42nd St., New York 36, N. Y.

Product Finishing, Sawell Publications Ltd., 4 Ludgate Circus, London, E. C. 4, England.

Production, Bramson Publishing Co., Box 1, Birmingham, Mich.

Products Finishing, 431 Main St., Cincinnati 2, Ohio.

Pro-Metal, Association Metallurgique S.A., Metallverband AG, Berne Switzerland.

Q

Queensland Government Mining Journal, Gordon and Gotch, Ltd., 262 Adelaide St., Brisbane, Australia.

R

Radex Rundschau, General Refractories Co., 1520 Locust St., Philadelphia 2, Pa.

Railway Age, Simmons-Boardman Publishing Corp., 30 Church St., New York 7, N. Y.

Railway Gazette, Tothill Press Ltd., 33 Tothill St., London, S. W. 1, England.

Real Sociedad Espanola de Fisica y Quimica, Anales, Serie B, Quimica, Facultad Ciencias, Cindad Universitarier, Madrid, Spain.

Recherche Aeronautique, 29, ave. de la Division-Leclerc, Chatillon-sous-Bagneux (Seine), France.

Recueil des travaux chimiques des pays-Bas, Lange Voorhoue 5, The Hague, Netherlands.

Referativnyi Zhurnal Metallurgiya, Gosudarstvennoe Izdatel'stvo Literatury po Metallurgii, Moscow, USSR.

Refractories Journal, London and Sheffield Publishing Co., Ltd., 7 Chesterfield Gardens, Curzon St., Mayfair, London, W. 1, England.

Rem-Cru Titanium Reviews, Rem-Cru Titanium Inc., Midland, Pa.

Review of Scientific Instruments, American Institute of Physics, 57 E. 55th St., New York 22, N. Y.

Revue de l'Aluminium, 77, blvd. Malesherbes, Paris (8e), France.

Revue de l'Industrie Minerale, 19, rue du Grand-Moulin, St.-Etienne (Loire), France.

Revue de Metallurgie, 25, rue de Clichy, Paris (9e), France.

Revue de la Soudure, l'Institut Belge de la Soudure, rue des Drapiers 21, Brussels, Belgium.

Revue des Produits Chimiques, 4, rue Lamblardie, Paris (12e), France.

Revue du Nickel, 47, bis ave. Hoche, Paris (8e), France.

Revue Francaise des Corps Gras, 60, rue de Richelieu, Paris (2e), France.

Revue Generale de l'Electricite, 12, place Henri-Bergson, Paris (8e), France.

Revue Generale de Mecanique, Éditions Science et Industrie, 6, ave. Pierre Premier de Serbie, Paris (16e), France.

Revue Technique, Luxembourgeoise, l'Association Luxembourgeoise des Ingenieurs et Industriels, 15, blvd. Roosevelt, Luxemburg.

Revue Universelle des Mines, l'Association des Ingenieurs Sortis, Liege, 22, rue Forgeur, Belgium.

Ricerca scientifica, Rome, Piazza della Liberta, 10, Italy.

Rivista di Meccanica, Associazione Meccanica Italiana, Milan, via Vittadini 6, Italy.

Rivista Italiana della Saldatura, Instituto Italiana della Saldatura, Genoa, viale Sauli, 3-5, Italy.

Roczniki Chemii, Polskie, Towarzstwo Chemiczne, Palac Kultury i Nauki, Pok. 2011, Warsaw, Poland.

Royal Institute of Chemistry, Journal, 30 Russell Sq., London, W. C. 1, England.

Royal Society of London, Transactions, Cambridge University Press, 200 Euston Rd., London, N. W. 1, England.

Royal Society, Proceedings, Burlington House, Piccadilly, London, W. 1, England.

Rudarsko-Metalurski Zbornik, Ljubljana, Askerceva 32, p. p. 311, Jugoslavia.

S

SAE Journal, Society of Automotive Engineers, Inc., 29 W. 39th St., New York 18, N. Y.

Schweissen und Schneiden, Deutschen Verbandes für Schweisstechnik EV, Düsseldorf, Harkortstr. 23, Germany.

Schweisstechnik, Schweisstechnischen Zentralanstalt, Vienna 18, Schumanngasse 31, Austria.

Schweizer Archiv (für angewandte Wissenschaft und Technik), Buchdruckerei Vogt-Schild, AG., Soloturn, Switzerland.

Science, American Association for the Advancement of Science, 1515 Massachusetts Ave., N. W., Washington 5, D. C.

Science and Culture, Indian Science News Association, 92 Upper Circular Rd., Calcutta 9, India.

Scientia Sinica, 38 Suchou Hutung, Peking, China.

Scientific American, 415 Madison Ave., New York 17, N. Y.

Scientific Research Institute, Journal, 31 Kamifujimae-cho, Komagome, Bunkyo-ku, Tokyo, Japan.

Scope, Creative Journals Ltd., 9 Grosvenor St., London, W. 1, England.

Sheet Metal Industries, Industrial Newspapers Ltd., John Adam House, 17-19 John Adam St., Adelphi, London, W. C. 2, England.

Shipbuilder and Marine Engine-Builder, Shipbuilder Press, 47 Victoria St., London, S. W. 1, England.

Societe d'Histoire Naturelle de Toulouse, Bulletin, Faculte des Sciences de l'Universite de Toulouse, France.

Societe des Ingenieurs Civils de France, Memoirs, 19, rue Blanche, Paris (9^e), France.

Societe Royal Belge, des Ingenieurs et de Industriels, 3 rue Ravenstein, Brussels, Belgium.

Societes Chimiques Belges, Bulletin, 50, ave. Franklin D. Roosevelt, Brussels, Belgium.

Society of Mechanical Engineers of Japan, Journal, Nippon Kihai Gaki, c/o Marunouchi Bldg., Marunouchi, Chiyoda-ku, Tokyo, Japan.

Soudage et Techniques Connexes, Publications de la Soudure Autogéne, 39, rue d'Amsterdam, Paris, (8^e), France.

South African Journal of Science, Kelvin House, Marshall and Holland Sts., Johannesburg, Union of South Africa.

South African Mechanical Engineer, South African Institution of Mechanical Engineers, Kelvin House, Marshall & Holland St., Johannesburg, Union of South Africa.

Soviet Physics, JETP, American Institute of Physics, 57 E. 55th St., New York 22, N. Y.

Soviet Physics, Technical Physics, American Institute of Physics, 57 E. 55th St., New York 22, N. Y.

SPE Journal, 34 E. Putnam Ave., Greenwich, Conn.

Spectro-Chimica Acta, Pergamon Press, Ltd., 4 & 5 Fitzroy Sq., London, W. 1, England.

Stahl und Eisen, Dusseldorf, Breite Str. 27, Germany.

Stal', Metallurgizdat, Moskva, Tscetnoi Bul'var 30 (Moscow, USSR).

Stanki i Instrument, Mashgiz, Moskva 12, Tret'iakovskii pr., 1 (Moscow, USSR).

Steam Engineer, Colin Troup, 90 High Holborn, London, W. C. 1, England.

Steel, Penton Publishing Co., Penton Bldg., Cleveland 13, Ohio.

Steel Processing and Conversion, Steel Publications, Inc., 624 Grant Bldg., Pittsburg 30, Pa.

Steel Products Manual, American Iron and Steel Institute, 150 E. 42nd St., New York, N. Y.
Steel Review, Information Officer, British Iron and Steel Federation, Steel House, Tothill St., London, S. W. 1, England.
Studii si Cercetari de Chimie, Academiei Republicii Populare Romina, Calea Victoriei 125, Bucharest, Rumania.
Sumitomo Metals, Sumitomo Metal Indstries, Ltd., Osaka, Japan.
Svensk Kemisk Tidskrift, Svenska Kemistsamfundet, Stockholm, Sweden.

T

Tappi, Technical Association of the Pulp and Paper Industry, 20th & Northampton St., Easton, Pa.
Technik und Betrieb, Thimiggasse 82, Vienna 18, Austria.
Technique de l'Eau et de l'Assainissement, 189 ave. A. J. Siegers, Brussels, Belgium.
Technique Modern, 92, rue Bonaparte, Paris (6e), France.
Technische Mitteilungen Krupp, Fried. Krupp Grafische Anstalt, Essen, Germany.
Teknisk Tidskrift, Box 841, Stockholm 1, Sweden.
Tecnica Metallurgica, la Association Tecnicade Estudios Metalurgicos, Paseo de Gracia, 50, Barcelona, Spain.
Termotecnica, Milan, viale Piave 20, Italy.
Textile Industries, W.R.C. Smith Publishing Co., 116 E. Crawford St., Dalton, Ga.
Tidsskrift for Kjemi, Bergvesen og Metallurgi Taknisk Ukeblads, Kronprinsensgt 17, Oslo, Norway.
Tin, 7 Union Ct., Old Bond St., Trafalgar Sq., London, England.
Tin and Its Uses, Tin Research Institute, Fraser Rd., Greenford, Middlesex, England.
Tisco, Tata Iron and Steel Co., Ltd., Jamshedpur, India. (Or 90 Broad St., New York, N. Y.).
Tohoku University, Science Reports, Research Institute, Sendai, Japan.
Tool Engineer, American Society of Tool Engineers, 10700 Puritan Ave., Detroit 38, Mich.
Tooling and Production, Huebner Publications, Inc., 1975 Lee Rd., Cleveland 18, Ohio.
Tremple, Societe des Produits, Houghton, 7, rue Ampere, Puteaux (Seine), France.
Trend in Engineering, Engineering Experiment Station, University of Washington, Seattle 5, Wash.

U

U. S. Bureau of Mines, Bulletin, U. S. Dept. of the Interior, Washington 25, D. C.
U. S. Bureau of Mines, Mineral Yearbook, U. S. Dept. of the Interior, Washington 25, D. C.
U. S. Bureau of Mines, Publications Distribution Section, 4800 Forks St., Pittsburgh, Pa.
U. S. Bureau of Mines, Report of Investigations, U. S. Dept. of the Interior, Washington 25, D. C.
U. S. Dept. of Commerce, National Bureau of Standards, Office of Technical Information, Washington 25, D. C.
U. S. National Advisory Committee for Aeronautics, Technical Note, Supt. of Documents, U. S. Government Printing Office, Washington 25, D. C.
Usines d'aujourd'hui, 106, blvd. Malesherbes, Paris (17e), France.

V

Vacuum, Edwards High Vacuum Ltd., Manor Royal, Crawley, Sussex, England.
VDI Zeitschrift, Verein Deutscher Ingenieure, (22a) Düsseldorf, Prinz-Georg-Str., Germany.
Vestnik Akademii Nauk SSSR, Akademii Nauk SSSR, Moskva, Shubinskii per., 10 (Moscow, USSR).
Vestnik Mashinostroeniya, Mashgiz, Moskva, 12, Staropanskii Pereulok, 3 (Moscow, USSR).
Vide, Societe Francaise des Ingenieurs, Techniciens du Vide, 44 rue de Renne, Paris (6e), France.

W

Waste Trade Journal, 425 W. 25th St., New York 1, N. Y.
Wastes Engineering, 305 E. 45th St., New York 17, N. Y.
Water & Sewage Works, 185 N. Wabash Ave., Chicago 1, Ill.
Wear-Usure-Verschleiss, P. O. Box 71, Delft, Netherlands.
Welder, Murex Welding Processes Ltd., Waltham Cross, Herts, England.
Welding and Metal Fabrication, Iliffe & Sons Ltd., Dorset House, Stamford St., London, S. E. 1, England.

Welding Engineer, Welding Engineer Publications, Inc., P. O. Box 28, Morton Grove, Ill.

Welding Journal, American Welding Society, 33 W. 39th St., New York 18, N. Y.

Welding Research Council, Bulletin, 29 W. 39th St., New York 18, N. Y.

Werkstatt und Betrieb, Carl Hauser Zeitschriftenverlag GmbH, Munich, 27 Kolbergerstr. 22, Germany.

Werkstattstechnik und Maschinenbau, Springer-Verlag, Berlin, Reichpietschufer 20, Germany.

Werkstoffe und Korrosion, Weinhein/Bergstr., Verlag Chemie GmbH, Germany.

West of Scotland Iron and Steel Institute, Journal, 39 Elmbank Crescent, Glasgow c2, Scotland.

Western Aviation, Occidental Publishing Co., 4328 Sunset Blvd., Los Angeles 29, Calif.

Western Electrical Engineers, Western Electric Co., Inc., 195 Broadway, New York 7, N. Y.

Western Machinery and Steel World, 681 Market St., San Francisco 5, Calif.

Western Metalworking (Western Metals), Jenkins Publishing Co., 2035 Miramar St., Los Angeles 57, Calif.

Western Union Technical Review, Western Union Telegraph Co., 60 Hudson St., New York 13, N. Y.

Wild-Barfield Heat-Treatment Journal, 21 Steelhouse Lane, Birmingham 4, England.

Wire (English Edition of Draht), Fachzeitschrift Draht, Coburg/Ofr., Postfach 691, Germany

Wire and Wire Products, Quinn Brown Publications, Corp., 453 Main St., Stamford, Conn.

Wire Industry, 33 Furnival St., London, E. C. 4, England.

Wire Production, Lindsay's Wire Publications, 28 Chapel Ash, Wolverhampton, Manchester, England.

World Oil, Gulf Publishing Co., P. O. Box 2608, Houston 1, Tex.

Z

Zavodskaya Laboratoriya, Metallurgizdat, Moskva, Tsvetnoi bul'var, 30 (Moscow, USSR).

Zeitschrift für Analytische Chemie, Springer-Verlag, Berlin W. 35, Reichpietschufer 20, Germany.

Zeitschrift für Angewandte Physik, Springer-Verlag, Berlin W. 35, Reichpietschufer 20, Germany.

Zeitschrift für Metallkunde, Dr. Riederer-Verlag GmbH, Stuttgart S., Marienstr. 50, Germany.

Zeitschrift für Maschinenbau und Fertigung, Verlag Carl Hanser, Munich 27, Leonard-Eckstr. 7, Germany.

Zeitschrift für Naturforschung, Verlag Zeitschrift für Naturforschung, Tubingen 14b, Postfach 61, Germany.

Zeitschrift für Schweisstechnik, Stauffacherquai 36, Zurich 1, Switzerland.

Zhurnal Analiticheskoi Khimii (Akademiya Nauk SSSR), Podsosenski per 21 (Moscow USSR).

Zhurnal Fizicheskoi Khimii, Akademiya Nauk SSSR, Moskva, Shubinskii per., 10 (Moscow, USSR).

Zvaranie, Slovenske Vydovatel'stvo, Technickej Literatury, Bratislava, Hurbano nam. 6, Czechoslovakia.

AUTHOR INDEX

Author's names are indexed by subject section and item number rather than by page. The numerals preceding the hyphen refer to the serial number of the item; the letter following the hyphen refers to the section.

B

C

F

G

H

I

J

K

L

Mc

M

O

P

U

SUBJECT INDEX

Since the annotations in this book are grouped into broad classes on the basis of process or property, the major emphasis in the index has been placed on materials, products and applications. Entries under the names of processes and properties usually refer only to general treatments of the subject. Wherever possible, items have been indexed under the name of the material or the type of material (metals, alloys, and metal forms) or product. For example, material on the rolling of aluminum appears as a subhead under the main entry "Aluminum alloys," and not under the main entry "Rolling." Similarly, material on the welding of steel plates in shipbuilding appears under the main entry, "Ships" rather than under the main entries "Welding" or "Steel plates." In general, subject entries conform to the usage in the "ASM-SLA Metallurgical Literature Classification," published by the American Society for Metals, 1950; Revised Edition, 1958.

Alloy systems in which one member is predominant are indexed under that member only. Where two or more members share predominance, entries have been made under each member.

A

I

N

V

W